

DELL™ POWEREDGE™ T610

TECHNICAL GUIDEBOOK INSIDE THE POWEREDGE T610



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THE DELL™ POWEREDGE™ T610

The Dell PowerEdge T610 server is a key data center building block for IT professionals seeking the highest level of performance, availability, and expandability in a 2-socket server. Ideally suited for small and medium businesses and remote office customers, the T610 delivers enhanced virtualization, improved design, and energy efficiency in a design engineered to address current and future business needs.

Strong IT Foundation

A solid IT foundation is critical for business success. The Dell PowerEdge T610 contributes to that foundation by offering many of the virtualization, system management, and usability capabilities you need while providing impressive power and thermals for overall energy efficiency. This mainstream two-socket Intel®-based tower server includes a rack-mount option and supports mission-critical applications and data processing. Built for reliability, this workhorse server helps deliver peace of mind and excellent value.

Purposeful Design

The PowerEdge T610 takes advantage of Dell's system commonality. Once your IT managers learn one system, they understand how to manage next-generation Dell servers. Logical component layout and power supply placement also provide a straightforward installation and redeployment experience. Inspired by IT professionals, the PowerEdge T610 is built to simplify daily operations and maximize uptime.

Energy-Optimized Technology

Using the latest Energy Smart technologies, the PowerEdge T610 helps reduce power consumption while increasing performance capacity over previous generations of Dell towers. Enhancements include efficient power supply units right-sized for system requirements, effective system-level design efficiency, policy-driven power and thermal management, and highly efficient standards-based Energy Smart components. These features are designed to maximize energy usage across our latest core data center servers without compromising performance.

Advanced Virtualization

Featuring Intel® Xeon® 5500 Series Processors, embedded hypervisors, 100% integrated I/O, and up to 100% more memory capacity than the previous server generations, the Dell PowerEdge T610 delivers better overall system performance and greater virtual machine-per-server capacity than ever before. With optional factory-integrated virtualization capabilities, you get tailored solutions – built with the latest industry-standard technologies from Dell and our trusted partners – which allow you to streamline deployment and simplify virtual infrastructures. Choose your hypervisor from market leaders such as VMware®, Citrix®, and Microsoft®, and enable virtualization with a few mouse clicks.

Simplified Systems Management

Gain control with the next-generation Dell OpenManage™ suite of management tools. These tools provide efficient operations and standards-based commands designed to integrate with existing systems for effective control. Dell Management Console (DMC) simplifies operations and creates stability by shrinking infrastructure management to one console. This console delivers a single view and a common data source into the entire infrastructure management. Built on Symantec® Management Platform, it has an easily extensible, modular foundation that can provide basic hardware management all the way up to more advanced functions, such as asset and security management. DMC is designed to reduce or eliminate manual processes enabling you to save time and money for more strategic technology usage. Secure, efficient, and more user friendly than its predecessors, the Dell Unified Server Configurator (USC) delivers “Instant On” integrated manageability through a single access point. You get quick, persistent access to the tool because it is embedded and integrated into the system for significant flexibility and Dell PowerEdge T610 Server capabilities. The USC is a one-stop shop for deploying operating systems with built-in driver installations, firmware updates, hardware configuration, and issue diagnoses.

SECTION 1. SYSTEM OVERVIEW

A. Overview / Description

The PowerEdge T610 will lead Dell's 11th Generation PowerEdge portfolio in key areas of differentiation, primarily:

- Virtualization
- Power, thermal, and efficiency
- Systems management
- Usability

B. Product Features Summary

FEATURE	DETAILS
Processor	Single or Dual Intel® 5500 series (Nehalem EP) Xeon® Processor Support for 60W, 80W, 95W processors
Front Side Bus	Intel® QuickPath Interconnect (QPI) links @ maximum of 6.4 GT/s
Number of Processors	2S
Number of Cores	2 or 4 cores
L2/L3 Cache	4MB and 8MB
Chipset	Intel® 5520 Chipset
DIMMs/Speed	12 RDIMM or UDIMM DDR3 – 800, 1066, 1333 MHz Memory module capacities of 1GB and 2GB UDIMMs; and 2GB, 4GB, or 8GB RDIMMs
Min/Max RAM	1GB / 96GB
Hard Drive Bays	Supports 2.5" or 3.5" HDD form factors Hot-plug HDDs Up to eight 3.5" or 2.5" SAS or SATA hard drives SAS/SATA mixing with two 2.5" SAS hard drives and up to six 2.5" SATA hard drives SAS/SATA mixing with two 3.5" SAS hard drives and up to six 3.5" SATA hard drives
Hard Drive Types	SAS, SATA, Near-line SAS, and SSD
Ext Drive Bay(s)	External USB floppy Optional SATA half-height optical drives such as DVD-ROM or DVD+/-RW Optional SATA or SCSI half-height (or full-height) tape back-up drive
Int. Hard Drive Controller	SAS6iR or PERC6i
Opt. Hard Drive Controller	PERC 5/E and PERC 6/E
BIOS	4MB flash for system and Video BIOS

FEATURE	DETAILS
Video	Integrated Matrox G200 , 8MB shared video memory
Availability	Hot-Plug Hard Drives, Hot-Plug Power; Memory SDDC, ECC, Control Line Parity, Optional redundant cooling
Server Management	Dell™ Embedded Server Management provides IPMI 2.0 compliance
I/O Slots	<p>5 PCIe Gen2 Two full-height, full-length x8 link (slot 2 and 3) Three full-height, half-length x4 link (slot 1,4 and 5)</p> <p>Note: All slots support up to 25W, but a maximum of two 25W cards and three 15W cards may be installed at any time, regardless of the slots they are installed in</p> <p>The storage controller card has a dedicated slot (PCIe x4) apart from the available 5 PCIe slots</p>
RAID	PERC 6/I, SAS 6iR and PERC 6/E
Embedded NIC	2 x TOE BCM 5709C (Dual-port Broadcom 5709C Gigabit network controller with iSCSI hardware key option)
USB	<p>Total: 9 , USB 2.0 compliant 6 in the back, 2 in the front, 1 internal</p>
Power Supplies	<p>Hot-plug redundant PSUs</p> <p>2 x 570W (Energy Smart PSU) (or) 2 x 870W (High Output PSU)</p> <p>Voltage is 90-264 VAC, auto ranging, 47-63Hz Heat dissipation - 2968.6 BTU/hr maximum (High Output), 1944.9 BTU/hr maximum (Energy Smart)</p> <p>Maximum inrush current - May reach 55A per power supply for 10ms or less</p>
Front Panel	<p>The system control panel is located on the front of the system chassis to provide user access to buttons, display, and I/O interfaces</p> <p>LCD on front panel for error messaging</p>
System ID	<p>System ID switch with LED indicator at rear side and LCD indication at front side</p> <p>128x20 pixel LCD with controls on front panel for system ID and error messaging</p> <p>LCD panel allows orientation for tower or rack horizontal screen view</p> <p>System ID for the PowerEdge T610 is 0x0237</p>
Fans	Optional Redundant Cooling. (Rear cooling fans with redundancy option)
Chassis	Tower or 5U rack mount

SECTION 2. MECHANICAL

A. Chassis Description

The PowerEdge T610 is a Tower or 5U rack-mount chassis. The updated design includes a new LCD, bezel and hard-drive carriers. Additional changes include tool-less rack latches, Embedded NIC O/iDRAC MAC address labels; support internal persistent storage (internal USB and SD card slots); and updated efficient power supplies.



PowerEdge T610 Tower Chassis



PowerEdge T610 Rack Chassis

B. Dimensions and Weight

Rack:

Height	21.77cm (8.57")
Width	48.25cm (19.00") (includes left & right rack latches)
Depth	62.10cm (24.40") (includes PSU with bezel)
Weight (maximum config)	35 kg (77 lbs)
Weight (empty)	20.2 kg (44.53 lbs)

Tower:

Height	44.10cm (17.40") (with feet)
Width	27.40cm (10.80") (with feet)
Depth	62.10cm (24.40") (includes PSU with bezel)
Weight (maximum config)	35 kg (77 lbs)
Weight (empty)	20.2 kg (45.30 lbs)

C. Front Panel View and Features



The following components and connectors are located on the front of the PowerEdgeT610:

- Power on indicator, power button
- USB connectors. Connects USB devices to the system. Two 4-pin, USB 2.0 compliant
- LCD menu buttons. Allows you to navigate the control panel LCD menu
- LCD panel. Provides system ID, status information, and system error messages
- Non-maskable Interrupt (NMI) button
- Ambient temperature sensor
- System identification button
- Optical drive (optional)
- Hard drives

D. Back Panel View and Features



The following components and connectors are located on the rear panel of the PowerEdge T610:

- NIC: Two RJ-45 for integrated 10/100/1000 Mbps Ethernet
- Serial connector: 9-pin, DTE, 16550 compatible
- USB: Six 4-pin, USB 2.0 compliant
- Video: 15-pin VGA
- Optional external VFlash card: One optional flash memory card slot with iDRAC6 Enterprise
- Rear system ID button
- Optional RJ-45 MEA connector
- Rear system status/ID blue/amber LED

E. Power Supply Indicators

The PSUs on the PowerEdge T610 have one status bi-color LED: green for AC power present and amber for a fault.






LED	POWER SUPPLY STATUS
	AC Power is not present
	AC Power is present
	Fault of any kind is detected
	DC Power is applied to the system
	PSU mismatch (when hot-added/swapped)

Table: Power Supply Indicator

F. NIC Indicators

INDICATOR	INDICATOR CODE
Link and Activity indicators are off	The NIC is not connected to the network
Link indicator is green	The NIC is connected to a valid network link at 1000 Mbps
Link indicator is amber	The NIC is connected to a valid network link at 10/100 Mbps
Link indicator is green blinking	Network data is being sent or received

G. Side Views and Features



H. Internal Chassis Views



I. Rails and Cable Management

Rack installation components such as rails are provided with the PowerEdge T610 Rack Kit. The rack installation components are with sliding rack mount with latest generation Cable Management Arm (CMA). The PowerEdge T610 features slam latches to offer easier removal from the rack.

When the system is installed in a rack, only Dell-approved CMAs should be installed behind the chassis.



Rails

- Enable the replacement of thumbscrews with slam latches on the chassis for easier stowing in the rack.
- Include the new, simple, and intuitive ReadyRail™ tool-less rack interface for square-hole and round-hole racks.
- Provide significantly improved compatibility with non-Dell racks.
- Static rails for the R610 & R710 fit in all types of four-post and two-post racks available in the industry including four-post threaded hole racks.

CMAs

- Provide much larger vent pattern for improved airflow through the CMA.
- Include a common support tray for eliminating CMA sag.
- Replaced tie wraps with hook and loop straps to eliminate risk of cable damage during cycling.
- Maintain key feature of being fully reversible with no conversion required.

J. Fans



Two or four 92mm single-rotor fans are in a module that is installed in the cooling shroud – fan connectors blind mate into the planar when the cooling shroud is installed. Each fan has a single wire harness that plugs into the planar fan connectors (FAN1 through FAN4). In a non-redundant configuration, the two fans that need to be installed are the ones that are closest to the rear of the chassis.

The iDRAC6 controls and monitors the speed of the fans. A fan speed fault or over-temperature condition results in a notification by iDRAC6.

The PowerEdge T610 Power Supply Units have integrated fans. They are cooled by fans in the front section. The system requires a blank module in place of the empty power supply slot.

All system fans are PWM fans. Redundant cooling (optional) is supported with one fan failing at a time.

K. Control Panel/LCD

The system control panel is located on the front of the system chassis to provide user access to buttons, display, and I/O interfaces.

Features of the system control panel include:

- ACPI-compliant power button with an integrated green power LED (controlled by ESM)
- 128x20 pixel LCD panel with controls
- Two navigation buttons
- One select button
- One system ID button
- Non-Maskable Interrupt (NMI) button (recessed)
- Ambient temperature sensor
- Two external USB 2.0 connectors

The LCD panel is a graphics display controlled by the iDRAC6, unlike the 9G panel which had its own CPLD. Error codes can be sent to the display by either iDRAC6 or BIOS.

The BIOS will have the ability to enter a "Secure Mode" through setup, which will lock the power and NMI buttons. When in this mode, pressing either button has no effect but does not mask other sources of NMI and power control.



Figure: PowerEdge T610 LCD Panel

L. Security

I. Cover Latch

A tooled latch is integrated in the side cover to secure it to the tower chassis. A locked bezel secures the cover latch.

II. Bezel

A metal bezel is mounted to the chassis front to provide the Dell ID. A lock on the bezel is used to protect unauthorized access to system hard drives and the system cover. System status (via the LCD) is viewable when the bezel is installed.

The bezel is standard for both the PowerEdge T610 tower and rack system.

III. Hard Drive

The front bezel of the system contains a lock. A locked bezel secures the system hard drives.

IV. TPM

The TPM is used to generate/store keys, protect/authenticate passwords, and create/store digital certificates. TPM can also be used to enable the BitLocker™ hard drive encryption feature in Windows Server® 2008.

V. Power-Off Security

There is a setting in the CMOS setup that disables the power button function such that the power switch cannot be accidentally activated.

VI. Intrusion Alert

A switch located on the cooling shroud is used to detect chassis intrusion. When the cover is opened, the switch circuit closes to indicate intrusion to ESM. When enabled, the software can provide notification to the customer that the cover has been opened.

VII. Secure Mode

BIOS has the ability to enter a secure boot mode via setup. This mode includes the option to lock out the power and NMI switches on the control panel or set up a system password. See the PowerEdge T610 BIOS Specification for details.

M. USB Peripherals

The PowerEdge T610 system supports the following USB devices:

- DVD drive (bootable; requires two USB ports)
- USB Key (bootable)
- Keyboard (only one USB keyboard is supported)
- Mouse (only one USB mouse is supported)

N. Battery

A replaceable coin cell CR2032 3V battery is mounted on the planar to provide back-up power for the Real-Time Clock and CMOS RAM on the ICH.

O. Field Replaceable Units (FRU)

The planar contains a serial EEPROM to store FRU information including Dell part number, part revision level, and serial number. The backplane SEP and the power supply microcontroller are also used to store FRU data.

SECTION 3. ELECTRICAL

A. Volatility

See Appendix A of this Technical Guidebook.

B. ePPID (Electronic Piece Part Identification)

ePPID is an electronic repository for information from the PPID label that is stored in non-volatile RAM. The BIOS reports the ePPID information using SMBIOS data structures. ePPID includes the following information:

- Dell part number
- Part revision level
- Country of origin
- Supplier ID code
- Date code (date of manufacture)
- Unique sequence number

COMPONENT	DESCRIPTION	STORAGE LOCATION
BOARDS		
Planar	PWA, PLN, SV, DELL, T610	iDRAC FRU
8" x 2.5" Backplane	PWA, BKPLN, SV, T610, 2.5SASX8	SEP
8" x 3.5" Backplane	PWA, BKPLN, SV, T610, 3.5SASX8	SEP
POWER SUPPLIES		
870W PowerEdge™ PSU	PWR SPLY, 870W, RDNT, ASTEC	PSU Microcontroller
	PWR SPLY, 870W, RDNT, DELTA	PSU Microcontroller
570W Energy Smart PSU	PWR SPLY, 570W, RDNT, ASTEC	PSU Microcontroller
	PWR SPLY, 570W, RDNT, COLDWATT	PSU Microcontroller
STORAGE CARDS		
PERC 6/i Integrated	ASSY, CRD, PERC6I-INT, SAS, NOSLED	FRU
PERC 6/E External	PWA, CTL, PCIE, SAS, PERC6/E,ADPT	FRU
SAS 6/iR Integrated	PWA, CTL, SAS, SAS6/IR, INTG	FRU

Table: ePPID Support list

SECTION 4. POWER, THERMAL, ACOUSTIC

A. Power Efficiencies

One of the main features of the 11th generation of PowerEdge servers is enhanced power efficiency. The PowerEdge T610 achieves higher power efficiency by implementing the following features:

- User-selectable power cap (subsystems will throttle to maintain the specified power cap)
- Improved power budgeting
- Larger heat-sinks for processors and chipset
- Accurate inlet temperature

- PSU / VR efficiency improvements
- Switching regulators instead of linear regulators
- Closed loop thermal throttling
- Increased rear venting / 3D venting
- PWM fans with an increased number of fan zones and configuration-dependent fan speeds
- Use of DDR3 memory (lower voltage than DDR2, UDIMM support)
- CPU VR dynamic phase shedding
- Random time interval for system starting allowing an entire rack to power on without exceeding the available power
- Allows an entire rack to power on without exceeding the available power
- BIOS Power/Performance options page
- BIOS-based CPU P-state manager (power management in a virtualized environment)
- Ability to slow down or throttle memory
- Ability to disable a CPU core
- Ability to turn off items not being used (i.e., USB ports, Embedded NICs, unused PCIe lanes, etc.)
- Option to run PCIe at Gen1 speeds instead of Gen2

B. Power Supply Specifications

The base redundant system consists of one hot-swap 570W Energy Smart power supply in a 1+1 configuration. An 870W High Output power supply is also available.

The power supplies connect indirectly to the planar via the Power Distribution Board (PDB). There is a power cable that connects between the PDB and the backplane. Another cable also connects the PDB to the optical and/or tape drives. The PS bay sheet metal is formed as key to prevent unsupported power supply from being installed in a PowerEdge T610 system.

Starting with this generation of Dell servers, the power supplies no longer have a FRU (Field Replaceable Units) EEPROM; FRU data is now stored in the memory of the PSU Microcontroller. Additionally, the PSU Firmware can now be updated by the iDRAC over the PMBus. Power is “soft-switched,” allowing power cycling via a switch on the front of the system enclosure, or via software control (through server management functions). The power system is compatible with industry standards, such as ACPI and the Microsoft® Windows Server® H/W Design Guide.

In a single power supply configuration, the power supply is installed in PS1 location and a blank module (metal cover) is installed in PS2 location for factory consistency. Electrically, the system can operate with a single power supply in either bay.



Figure: PowerEdge T610 Power Supply

AC POWER SUPPLY (PER POWER SUPPLY)	
Wattage	870W (high output) 570W (Energy Smart)
Voltage	90-264 VAC, autoranging, 47-63Hz
Heat Dissipation	2968.6 BTU/hr maximum (high output) 1944.9 BTU/hr maximum (Energy Smart)
Maximum Inrush Current	Under typical line conditions and over the entire system ambient operating range, the inrush current may reach 55A per power supply for 10ms or less

C. Environmental Specifications

TEMPERATURE	
Operating	10° to 35°C (50° to 95°F) Note: For altitudes above 2950 feet, the maximum operating temperature is de-rated 1°F/550 ft.
Storage	-40° to 65°C (-40° to 149°F)
RELATIVE HUMIDITY	
Operating	20% to 80% (non-condensing) with a maximum humidity gradation of 10% per hour
Storage	5% to 95% (non-condensing) with a maximum humidity gradation of 10% per hour
MAXIMUM VIBRATION	
Operating	0.26 Gms (10 to 350Hz) for 5 mins. in operational orientations
Storage	1.54 Gms (10 to 250Hz) for 10 mins. in all orientations
MAXIMUM SHOCK	
Operating	Half sine shock in all operational orientations of 31G plus or minus 5% with a pulse duration of 2.6ms plus minus 10%
Storage	Half sine shock on all six sides of 71G plus or minus 5% with a pulse duration of 2ms plus minus 10%
ALTITUDE	
Operating	-16 to 3048 m (-50 to 10,000 ft) Note: For altitudes above 2950 feet, the maximum operating temperature is de-rated 1°F/550 ft.
Storage	Storage: -16 to 10,600 m (-50 to 35,000 ft)

D. Power Consumption Testing

FEATURE	ENERGY SMART PSU	HIGH OUTPUT PSU
Dimensions	L-206.4 mm ¹ x W-67.5 mm x H-76.5 mm	
Status Indicators	1 x bi-color Light Emitting Diode	
Integrated Fans	1 x 60 mm	
Fixed Input Plug	IEC-C14	
AC Cord Rating	15 Amps @ 120 VAC, 10 Amps @ 240 VAC	
Input Voltage	90 – 264 VAC	
Auto-ranging	Yes	
Line Frequency	47 – 63Hz	
Maximum Inrush Current	55 Amps per supply for 10 ms or less	
Hot-Swap Capability	Yes	
Output Power	570 Watts	870 Watts
Maximum Heat Dissipation	1944.9 BTU per hour	2968.6 BTU per hour
Efficiency (20% - 100% Load)	86.9 – 90.5% @ 115 VAC 88 – 92% @ 230 VAC	85 – 88% @ 115 VAC 87 – 90% @ 230 VAC

1. Does not include the power supply handle or ejection tab

E. Maximum Input Amps

Max input current (High Output): 12A @ 90 VAC and 6A @ 180 VAC

Max input current (EnergySmart): 7.8A @ 90 VAC and 3.9A @ 180 VAC

F. EnergySMART Enablement

The 11G family implements aspects of Dell's new Energy Smart strategy.

Major differences include:

- Discontinuing Energy Smart branded servers with limited configurations and instead offering Energy Smart components on a portfolio level, such as high capacity and Energy Smart power supplies
- Allowing customers to order either a lowest power footprint configuration or a best performance-per-watt configuration
- Offering Energy Smart-selected components such as DIMMs or hard drives, but not "cherry picking" or screening individual manufacturer's components based on energy consumption

G. Acoustics

The acoustical design of the PowerEdge T610 reflects the following:

- Adherence to Dell's high sound quality standards. Sound quality is different from sound power level and sound pressure level in that it describes how humans respond to annoyances in sound, like whistles, hums, etc. One of the sound quality metrics in the Dell specification is prominence ratio of a tone, and this is listed in the table below.
- Office environment acoustics. Compare the values for LpAm in the table below and note that they are much lower than ambient measurements of typical office environments.
- Configurable for minimum noise. Dell's advanced thermal control results in the ability of the acoustically sensitive user to configure for minimum noise. Some of the perhaps less intuitive but potentially important decision-making configuration examples are listed below.

- Fan speed hence noise level for the redundant fan configuration (four fans) is slightly lower (~ 2 dBA) than that for the nonredundant fan configuration (two fans).
- Noise levels for the 2.5" chassis are generally lower (~ 2 dBA) than those for the 3.5" chassis.
- In the 3.5" chassis, fan speeds hence noise levels are lower (~ 3 dBA) when fewer than three Hard Disk Drives are installed.
- Lower speed Hard Disk Drives (e.g., 10k) are generally quieter (~ 1 -2 dBA) than 15k drives.
- Most typical configurations will perform as listed in the table below. However, some less typical configurations and components can result in higher noise levels. Some specific examples are configurations with greater than three PCI cards, a 10Gb/E card, or a Perc6/E card.
- (Please note that dBA values are not additive, e.g., incorporating a change for 2 dBA reduction and another change for 3 dBA will not generally produce a 5 dBA reduction.)
- Noise ramp and descent at bootup. Fan speeds hence noise levels ramp during the boot process in order to add a layer of protection for component cooling in the case that the system were not to boot properly.

The PowerEdge T610 with redundant fan configuration (4x RK388 fans), redundant power configuration (2x 870W FU096 power supplies), 2x CPUs (2.40 GHz, Quad-Core E5530), 5x 2GB DIMMs, 1x DVD drive, 2x 2-Port X3959 NIC cards, Perc 6i card, and 4x hard disk drives described below:

POWEREDGE T610 – 2.5" CHASSIS WITH 4X HDDS. THE MAXIMUM VALUES FROM TWO DIFFERENT CONFIGURATIONS TESTED (4X 10KRPM 147GB XK112 SAS HDDS; 4X 15KRPM 76GB RW675 SAS HDDS) ARE LISTED.

CONDITION IN 23±2° C AMBIENT	LwA-UL, bels	LpA, dBA	TONES
Standby	3.0	15	No prominent tones
Idle	5.2	36	No prominent tones
Active Hard Disk Drives	5.3	36	No prominent tones
Stressed Processor	5.3	36	No prominent tones

POWEREDGE T610 – 3.5" CHASSIS WITH 4X 15KRPM 300GB GP880 SAS HDDS.

CONDITION IN 23±2° C AMBIENT	LwA-UL, bels	LpA, dBA	TONES
Standby	3.0	15	No prominent tones
Idle	5.5	38	No prominent tones
Active Hard Disk Drives	5.6	39	No prominent tones
Stressed Processor	5.5	38	No prominent tones

Definitions

Standby: AC Power is connected to Power Supply Units but system is not turned on.

Idle: Reference ISO7779 (1999) definition 3.1.7; system is running in its OS but no other specific activity.

Active Hard Drives: An operating mode per ISO7779 (1999) definition 3.1.6; Section C.9 of ECMA-74 9th ed. (2005) is followed in exercising the hard disk drives.

Stressed Processor: An operating mode per ISO7779 (1999) definition 3.1.6; SPECPower set to 50% loading is used.

LwA-UL: The upper limit sound power level (LwA) calculated per section 4.4.2 of ISO 9296 (1988) and measured in accordance with ISO7779 (1999).

LpA: The average bystander position A-weighted sound pressure level calculated per section 4.3 of ISO9296 (1988) and measured in accordance with ISO7779 (1999). The system is placed on the floor.

Tones: Criteria of D.5 and D.8 of ECMA-74 9th ed. (2005) are followed to determine if discrete tones are prominent. The system is placed in center of ISO7779 table and acoustic transducer is at front operator position, ref ISO7779 (1999) Section 8.6.1, Position P4.

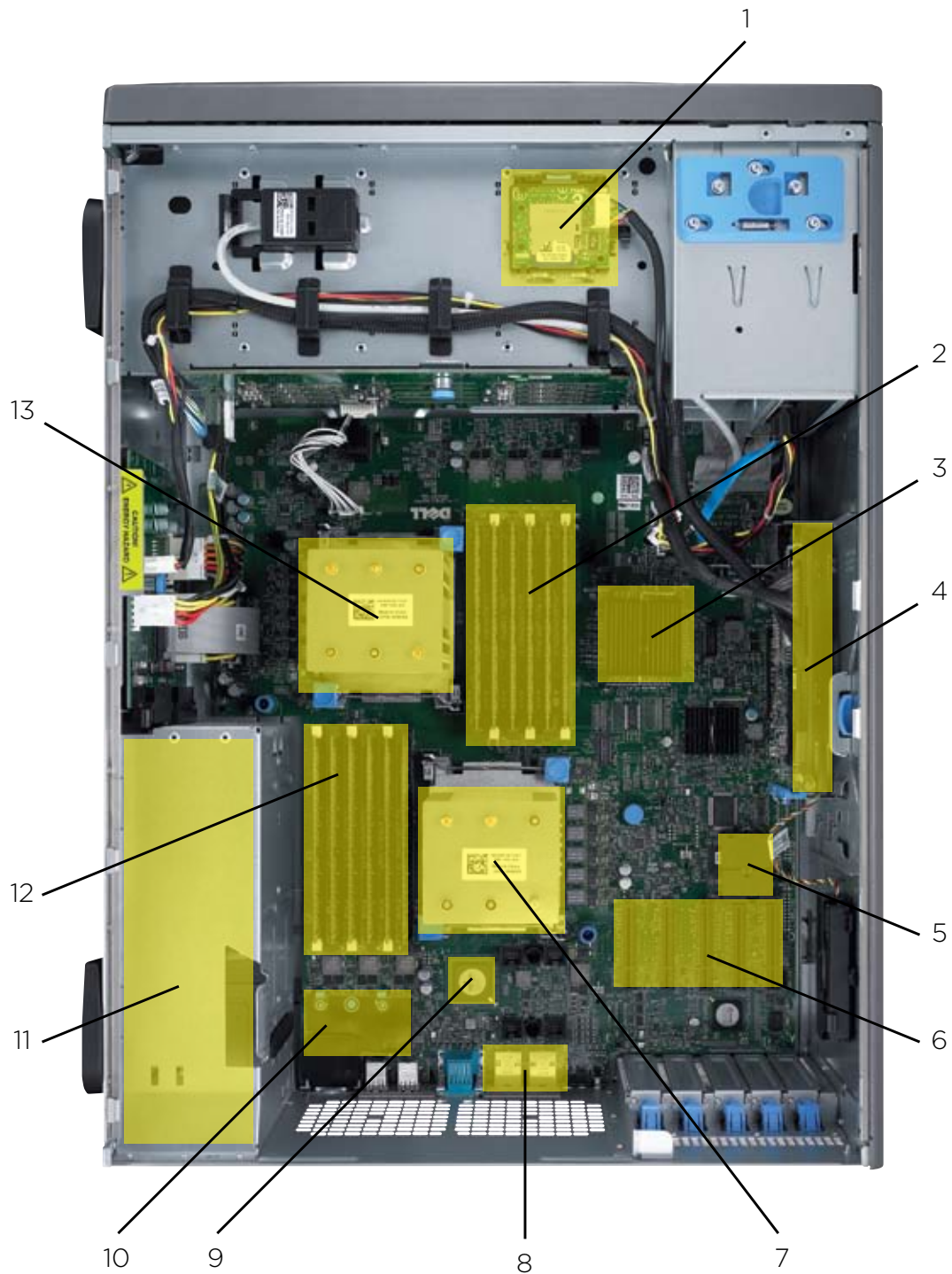
Section 5. Block Diagram

The PowerEdge T610 electrical system consists of the planar subsystem with TPM, iDRAC6 Enterprise, and iSCSI key options, PDB and power supply subsystem, control panel, SAS backplane, and storage (PERC6/i or SAS6/iR) card. The features and functions of these electrical subsystems are detailed below.

The PowerEdge T610 motherboard dimensions are 17.25" x 15". The following figure shows the main components on the PowerEdge T610 planar:



Figure: PowerEdge T610 Main Components



1. Internal SD Module
(Embedded Hypervisor Optional)

2. DIMM Slots

3. Intel 5520 Chipset

4. Storage Card

5. iDRAC6 Express / Lifecycle Controller

6. PCIe Gen2 Slots

7. Heat Sink/Processor Socket

8. Embedded Network Interface Ports

9. Broadcom 5709c Network Interface Chip

10. iDRAC6 Enterprise (Optional)

11. Dual Redundant Power Supplies (Optional)

12. DIMM Slots

13. Heat Sink/Processor Socket

SECTION 6. PROCESSORS

A. Overview / Description

The Intel® 5500 series 2S processor (Nehalem - EP), is the microprocessor designed specifically for servers and workstation applications. The processor features quad-core processing to maximize performance and performance/watt for data center infrastructures and highly dense deployments. The Nehalem-EP 2S processor also features Intel's Core™ micro-architecture and Intel 64 architecture for flexibility in 64-bit and 32-bit applications and operating systems.

The 5500 series 2S processor (Nehalem EP) utilizes a 1366-contact Flip-Chip Land Grid Array (FC-LGA) package that plugs into a surface mount socket. PowerEdge T610 provides support for up to two 5500 series 2S processors (Nehalem EP).

NEHALEM-EP 2S PROCESSOR	FEATURES
Cache Size	32KB instruction, 32KB data, 4 or 8MB (shared)
Multi-processor Support	1-2 CPUs
Package	LGA1366

Table: Nehalem-EP Features

B. Features

Key features of the 5500 series 2S processor (Nehalem EP) include:

- Four or two cores per processor
- Two point-to-point QuickPath Interconnect links at up to 6.4 GT/s
- 1366-pin FC-LGA package
- 45 nm process technology
- No termination required for non-populated CPUs (must populate CPU socket 1 first)
- Integrated three-channel DDR3 memory controller at up to 1333MHz
- Compatible with existing x86 code base
- MMX™ support
 - Execute Disable Bit Intel Wide Dynamic Execution
- Executes up to four instructions per clock cycle
- Simultaneous Multi-Threading (Hyper-Threading) capability
- Support for CPU Turbo Mode (on certain SKUs)
 - Increases CPU frequency if operating below thermal, power, and current limits
- Streaming SIMD (Single Instruction, Multiple Data) Extensions 2, 3, and 4
- Intel 64 Technology for Virtualization
- Intel VT-x and VT-d Technology for Virtualization
- Demand-based switching for active CPU power management as well as support for ACPI P-States, C-States, and T-States

C. Supported Processors

MODEL	SPEED	POWER	CACHE	CORES
X5570	2.93GHz	95W	8M	4
X5560	2.80GHz	95W	8M	4
X5550	2.66GHz	95W	8M	4
E5540	2.53GHz	80W	8M	4
E5530	2.40GHz	80W	8M	4
E5520	2.26GHz	80W	8M	4
L5520	2.26GHz	60W	8M	4
E5506	2.13GHz	80W	4M	4
L5506	2.13GHz	60W	4M	4
E5504	2.00GHz	80W	4M	4
E5502	1.86GHz	80W	4M	2

D. Processor Configurations

Single CPU Configuration

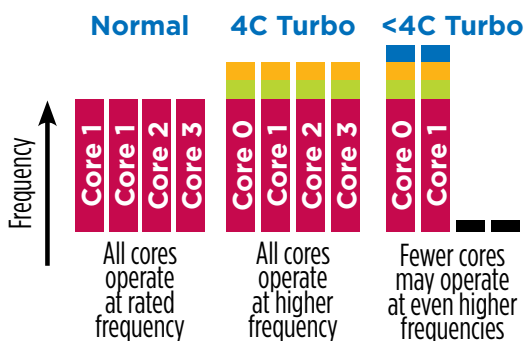
The PowerEdge T610 is designed such that a single processor placed in the CPU1 socket will function normally, however PowerEdge T610 systems require a CPU blank in the CPU2 socket for thermal reasons. The system will be held in reset if a single processor is placed in the CPU2 socket.

Performance Enhancements

Intel Xeon® 5500 Series Processor (Nehalem-EP)

Intel® Turbo Boost Technology

Increases performance by increasing processor frequency and enabling faster speeds when conditions allow



Higher performance on demand

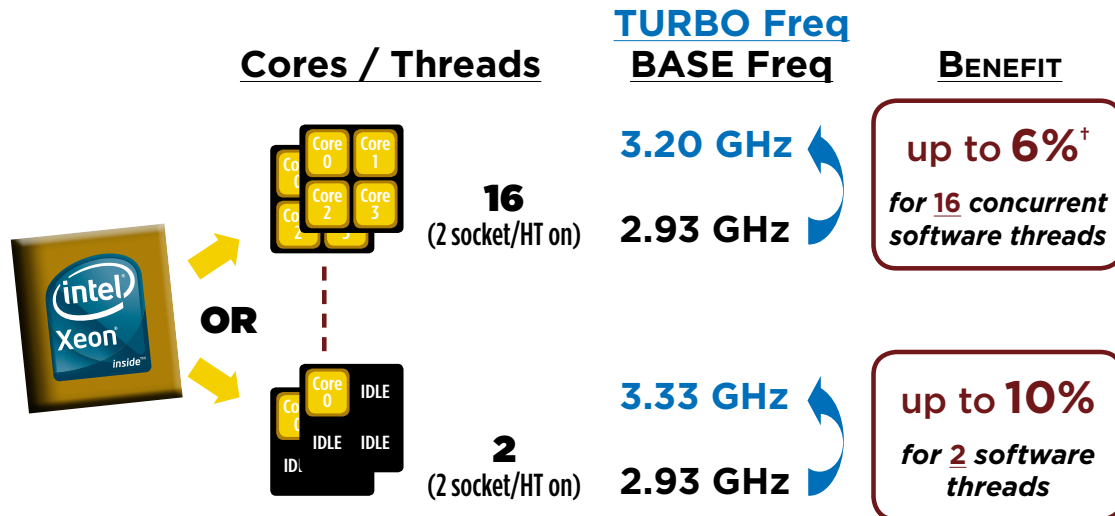
Intel® Hyper-Threading Technology

Increases performance for threading applications delivering greater throughput and responsiveness



Higher performance for threaded workloads

Intel® Turbo Boost Technology



Improves application responsiveness
Delivers higher processor frequency on demand

MODEL	SPEED	POWER	CACHE	CORES
X5570	2.93GHz	95W	8M	4
X5560	2.80GHz	95W	8M	4
X5550	2.66GHz	95W	8M	4
E5540	2.53GHz	80W	8M	4
E5530	2.40GHz	80W	8M	4
E5520	2.26GHz	80W	8M	4
L5520	2.26GHz	60W	8M	4
E5506	2.13GHz	80W	4M	4
L5506	2.13GHz	60W	4M	4
E5504	2.00GHz	80W	4M	4
E5502	1.86GHz	80W	4M	2

CPU Power Voltage Regulation Modules (EVRD 11.1)

Voltage regulation to the 5500 series 2S processor (Nehalem EP) is provided by EVRD (Enterprise Voltage Regulator-Down). EVRDs are embedded on the planar. CPU core voltage is not shared between processors. EVRDs support static phase shedding and power management via the PMBus.

SECTION 7. MEMORY

A. Overview / Description

The PowerEdge T610 utilizes DDR3 memory providing a high performance, high-speed memory interface capable of low latency response and high throughput. The PowerEdge T610 supports Registered ECC DDR3 DIMMs (RDIMM) or Unbuffered ECC DDR3 DIMMs (UDIMM).

Key features of the PowerEdge T610 memory system include:

- Registered (RDIMM) and Unbuffered (UDIMM) DDR3 technology
- Each channel carries 64 data and eight ECC bits
- Support for up to 96GB of RDIMM memory (with 8GB RDIMMs)
- Support for up to 24GB of UDIMM memory (with 2GB UDIMMs)
- Support for 1066/1333MHz single and dual rank DIMMs
- Support for 1066MHz quad rank DIMMs
- Single DIMM configuration with DIMM at socket DIMM A1
- Support ODT (On Die Termination)
- Clock gating (CKE) to conserve power when DIMMs are not accessed
- DIMMs will enter a low-power self-refresh mode
- I2C access to SPD EEPROM and thermal sensors
- Single Bit Error Correction
- SDDC (Single Device Data Correction - x4 or x8 devices)
- Multi Bit Error Detection
- Support for Closed Loop Thermal Management on RDIMMs and UDIMMs
- Support for Advanced ECC mode
- Support for Memory Optimized mode
- Support for Memory Mirroring
- No support for Memory Sparing

B. DIMMs Supported

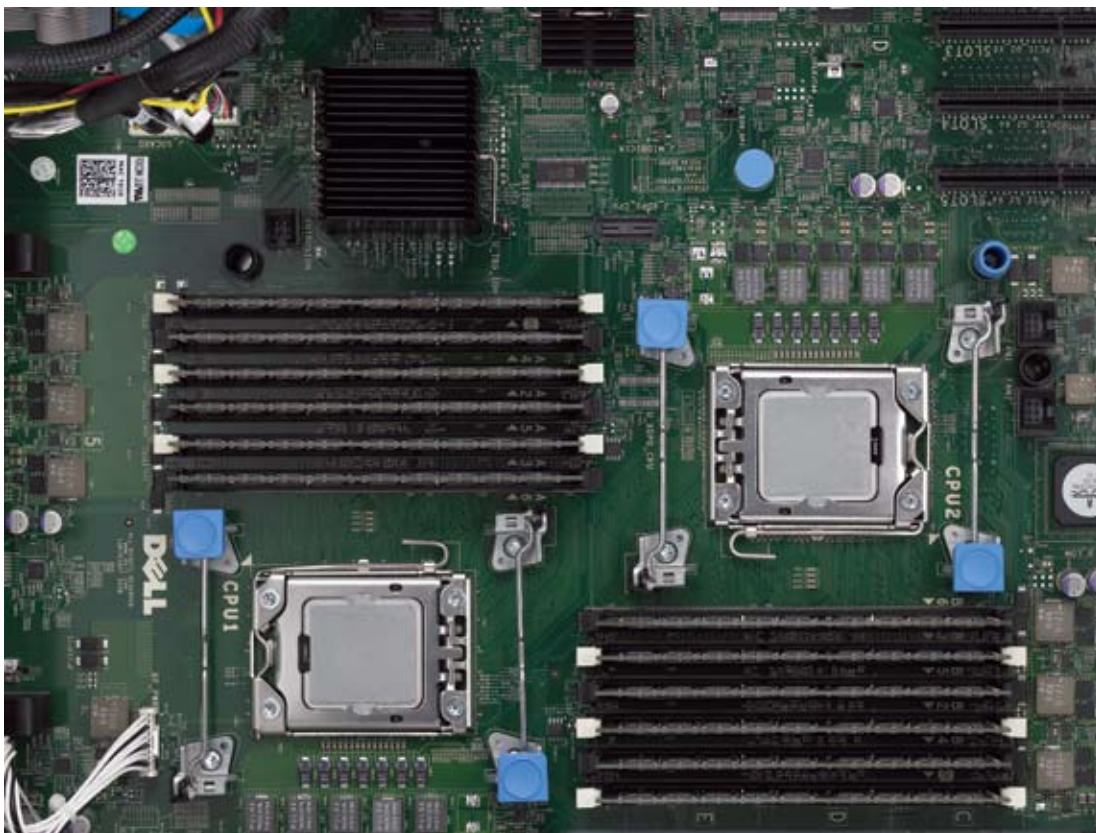
The DDR3 memory interface consists of three channels, with up to two RDIMMs or UDIMMs per channel for single/dual rank and up to two RDIMMs per channel for quad rank. The interface uses 2GB, 4GB, or 8GB RDIMMs; only 1GB or 2GB UDIMMs are supported. The memory mode is dependent on how the memory is populated in the system:

- Three channels per CPU populated identically
 - Typically, the system will be set to run in Memory Optimized (Independent Channel) mode in this configuration. This mode offers the most DIMM population flexibility and system memory capacity, but offers the least number of RAS (reliability, availability, service) features.
 - All three channels must be populated identically.
- The first two channels per CPU populated identically with the third channel unused
 - Typically, two channels operate in Advanced ECC (Lockstep) mode with each other by having the cache line split across both channels. This mode provides improved RAS features (SDDC support for x8-based memory).
 - For Memory Mirroring, two channels operate as mirrors of each other — writes go to both channels and reads alternate between the two channels.
- One channel per CPU populated
 - This is a simple Memory Optimized mode. No mirroring or sparing is supported.

The PowerEdge T610 memory interface supports memory demand and patrol scrubbing, single-bit correction and multi-bit error detection. Correction of a x4 or x8 device failure is possible through the

Advanced ECC mode and the SDDC code. Correction of a x4 device failure is possible through Memory Optimized mode.

- If DIMMs of different speeds are mixed, all channels will operate at the fastest common frequency.
- RDIMMs and UDIMMs cannot be mixed.
- If memory mirroring is enabled, identical DIMMs must be installed in the same slots across both channels. The third channel of each processor is unavailable for memory mirroring.
- The first DIMM slot in each channel is color-coded with white ejection tabs for ease of installation.
- The DIMM sockets are placed 450 mils (11.43 mm) apart, center-to-center in order to provide enough space for sufficient airflow to cool stacked DIMMs.
- The PowerEdge T610 supports up to 12 DIMMs. DIMMs must be installed in each channel starting with the DIMM slot farthest from the processor. Population order is identified by the silkscreen designator and the System Information Label (SIL) label located on the cooling shroud.
 - Independent: {1, 2, 3}, {4, 5, 6}
 - Lockstep or Mirrored: {2, 3}, {5, 6}
 - Quad Rank or UDIMM: {1, 2, 3}, {4, 5, 6}



C. Speed

The memory frequency is determined by a variety of inputs:

- Speed of the DIMMs
- Speed supported by the CPU
- Configuration of the DIMMs

NOTE: For Quad Rank DIMMs mixed with Single- or Dual-Rank DIMMs, the QR DIMM needs to be in the slot with the white ejection tabs (the first DIMM slot in each channel). There is no requirement for the order of SR and DR DIMMs

DIMM TYPE	DIMM 0	DIMM 1	DIMM 2	NUMBER OF DIMMS	800	1066	1333
UDIMM	SR			1			
	DR			1			
	SR	SR		2			
	SR	DR		2			
	DR	DR		2			
RDIMM	SR			1			
	DR			1			
	QR			1			
	SR	SR		2			
	SR	DR		2			
	DR	DR		2			
	QR	SR		2			
	QR	DR		2			
	QR	QR		2			
	SR	SR	SR	3			
	SR	SR	DR	3			
	SR	DR	DR	3			
	DR	DR	DR	3			

Note: For QR mixed with a SR/DR DIMM, the QR needs to be in the white DIMM connector. There is no requirement in the order of SR and DR DIMMs.

	Supported
	Not Supported

NOTE: For Quad Rank DIMMs mixed with single- or dual-rank DIMMs, the QR DIMM needs to be in the slot with the white ejection tabs (the first DIMM slot in each channel). There is no requirement for the order of SR and DR DIMMs

D. Supported Configurations

Table: RDIMM Memory Configurations (Each Processor)

MEMORY MODE	RDIMM MEMORY MODULE SIZE	MEMORY SOCKETS						SINGLE PROCESSOR		DUAL PROCESSOR	
		1		2		3		PHYSICAL MEMORY (GB)	AVAILABLE MEMORY (GB)	PHYSICAL MEMORY (GB)	AVAILABLE MEMORY (GB)
			4		5		6				
OPTIMIZER	2GB	x						2	All	4	All
		x		x				4		8	
		x		x		x	x	6		12	
		x	x					4		8	
		x	x	x	x			8		16	
		x	x	x	x	x	x	12		24	
	4GB	x						4	All	8	All
		x		x				8		16	
		x		x		x	x	12		24	
		x	x					8		16	
		x	x	x	x			16		32	
		x	x	x	x	x	x	24		48	
	8GB ^a	x						8	All	16	All
		x		x				16		32	
		x		x		x	x	24		48	
		x	x					16		32	
		x	x	x	x			32		64	
		x	x	x	x	x	x	48		96	
ADVANCED ECC ^b OR MIRRORING	2GB	None		x		x		4	2	8	4
				x	x	x	x	8	4	16	8
	4GB	None		x		x		8	4	16	8
				x	x	x	x	16	8	32	16
	8GB	None		x		x		16	8	32	16
				x	x	x	x	32	16	64	32

^a When available

^b Requires x4- or x8-based memory modules

Table: UDIMM Memory Configurations (Each Processor)

MEMORY MODE	MEMORY MODULE SIZE	MEMORY SOCKETS						SINGLE PROCESSOR		DUAL PROCESSOR	
		1	2	3	4	5	6	PHYSICAL MEMORY (GB)	AVAILABLE MEMORY (GB)	PHYSICAL MEMORY (GB)	AVAILABLE MEMORY (GB)
OPTIMIZER	1GB	x						1	All	2	All
		x		x				2		4	
		x		x		x		3		6	
		x	x	x	x			4		8	
		x	x	x	x	x	x	6		12	
		x						2	All	4	All
	2GB	x		x				4		8	
		x		x		x		6		12	
		x	x	x	x			8		16	
		x	x	x	x	x	x	12		24	
		x						2		4	
ADVANCED ECC ^a	1GB	None	x		x			2	All	All	All
			x	x	x	x		4		All	All
	2GB	None	x		x			4	All	All	All
			x	x	x	x		8		All	All
MIRRORING	1GB	None	x		x			2	1	4	2
			x	x	x	x		4	2	8	4
	2GB	None	x		x			4	2	8	4
			x	x	x	x		8	4	16	8

^a Requires x4- or x8-based memory modules**E. Slots / Risers**

The PowerEdge T610 has 12 DIMM slots for memory. It does not have any riser cards for DIMM population.

F. Sparing

The PowerEdge T610 does not support memory sparing.

G. Mirroring

The PowerEdge T610 supports memory mirroring in certain configurations, refer to embedded memory matrix spreadsheet in section 9-H for supported configurations.

H. RAID

The PowerEdge T610 supports memory mirroring.

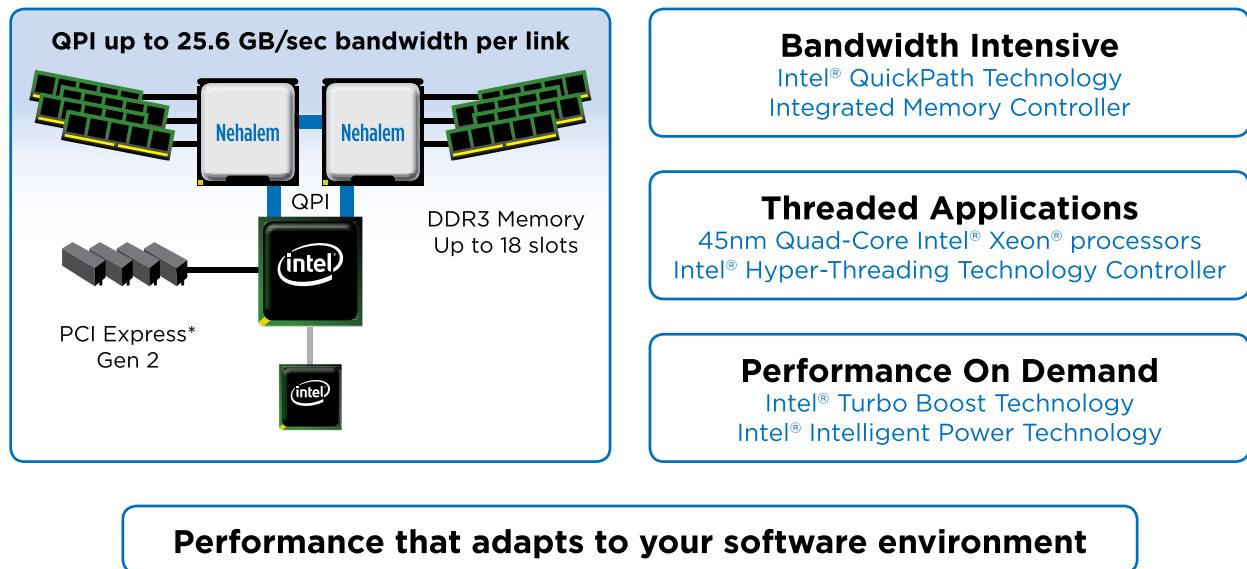
SECTION 8. CHIPSET

A. Overview / Description

The PowerEdge T610 planar incorporated the Intel 5520 chipset for I/O and processor interfacing. Intel 5520 Chipset is designed to support Intel's 5500 series processors (code named Nehalem-EP), QPI interconnect, DDR3 memory technology, and PCI Express Generation 2.

Delivering Intelligent Performance

Next Generation Intel® Microarchitecture



The Intel 5520 Chipset

The planar uses the Intel® 5520 chipset to provide a link between the 5500 series 2S processor (Nehalem EP) and I/O components. The main components of the IOH consist of two full-width QuickPath Interconnect links (one to each processor), 36 lanes of PCI Express Gen2, a x4 Direct Media Interface (DMI), and an integrated IOxAPIC.

IOH QuickPath Interconnect (QPI)

The QuickPath Architecture consists of serial point-to-point interconnects for the processors and the IOH. The PowerEdge T610 has a total of three QuickPath Interconnect (QPI) links: one link connecting the processors and links connecting both processors with the IOH. Each link consists of 20 lanes (full-width) in each direction with a link speed of up to 6.4 GT/s. An additional lane is reserved for a forwarded clock. Data is sent over the QPI links as packets.

The QuickPath Architecture implemented in the Chipset and CPUs features four layers. The Physical layer consists of the actual connection between components. It supports Polarity Inversion and Lane Reversal for optimizing component placement and routing. The Link layer is responsible for flow control and the reliable transmission of data. The Routing layer is responsible for the routing of QPI data packets. Finally, the Protocol layer is responsible for high-level protocol communications, including the implementation of a MESIF (Modify, Exclusive, Shared, Invalid, Forward) cache coherence protocol.

Intel Direct Media Interface (DMI)

The DMI (previously called the Enterprise Southbridge Interface) connects the Intel 5520 Chipset with the Intel I/O Controller Hub (ICH). The DMI is equivalent to a x4 PCIe Gen1 link with a transfer rate of 1 Gb/s in each direction.

PCI Express Generation 2

PCI Express is a serial point-to-point interconnect for I/O devices. PCIe Gen2 doubles the signaling bit rate of each lane from 2.5 Gb/s to 5 Gb/s. Each of the PCIe Gen2 ports are backwards-compatible with Gen1 transfer rates.

In the Intel 5520 Chipset, there are two x2 PCIe Gen2 ports (1Gb/s) and eight x4 PCIe Gen2 ports (2 Gb/s). The x2 ports can be combined as a x4 link; however, this x4 link cannot be combined with any of the other x4 ports. Two neighboring x4 ports can be combined as a x8 link, and both resulting x8 links can combine to form a x16 link.

Intel I/O Controller Hub 9 (ICH9)

ICH9 is a highly integrated I/O controller, supporting the following functions:

- Six x1 PCIe Gen1 ports, with the capability of combining ports 1-4 as a x4 link
 - These ports are unused on the PowerEdge T610
- PCI Bus 32-bit Interface Rev 2.3 running at 33MHz
- Up to six Serial ATA (SATA) ports with transfer rates up to 300 MB/s
 - The PowerEdge T610 features two SATA ports for optional internal optical drive and/or tape backup
- Six UHCI and two EHCI (High-Speed 2.0) USB host controllers, with up to twelve USB ports
 - The PowerEdge T610 has eight external USB ports and one internal USB port. Refer to the Whoville Hardware/BIOS Specification for the USB assignments for each platform
- Power management interface (ACPI 3.0b compliant)
- Platform Environmental Control Interface (PECI)
- Intel Dynamic Power Mode Manager
- I/O interrupt controller
- SMBus 2.0 controller
- Low Pin Count (LPC) interface to Super I/O, Trusted Platform Module (TPM), and SuperVU
- Serial Peripheral Interface (SPI) support for up to two devices
 - The PowerEdge T610's BIOS is connected to the ICH using SPI

SECTION 9. BIOS

A. Overview / Description

The PowerEdge T610 BIOS is based on the Dell BIOS core and supports the following features:

- IA-32 Nehalem-EP 2S Support
- Simultaneous Multi-Threading (SMT) support
- CPU Turbo Mode support
- PCI 2.3 compliant
- Plug n' Play 1.0a compliant
- MP (Multiprocessor) 1.4 compliant
- Boot from hard drive, optical drive, iSCSI drive, USB key, and SD card
- ACPI support
- Direct Media Interface (DMI) support
- PXE and WOL support for on-board NICs
- Memory mirroring
- SETUP access through <F2> key at end of POST
- USB 2.0 (USB boot code is 1.1 compliant)
- F1/F2 error logging in CMOS
- Virtual KVM, CD, and floppy support
- Unified Server Configurator support
- Power management support including DBS, Power Inventory and multiple Power Profiles

The PowerEdge T610 BIOS does not support the following:

- Embedded Diags
- BIOS language localization
- BIOS recovery after bad flash (but can be recovered from iDRAC6 Express)

Refer to the PowerEdge T610 BIOS Specification document for information related to BIOS.

B. Supported ACPI States

Advanced Configuration and Power Interface – A standard interface for enabling the operating system to direct configuration and power management.

The Nehalem processor supports the following C-States: C0, C1, C1E, C3, and C6. The PowerEdge T610 will support all of the available C-States.

The PowerEdge T610 will support the available P-States as supported by the specific Nehalem processors:

PROC NUMBER	QFD #	FREQUENCY	STANDARD TDP	LFM TDP	P-STATE	NOTES
		1.60			Pmin+1	
		1.73			Pmin+1	
E5502	Q1G8	1.86	80	75	Pmin+2	D-0
E5504	Q1GM	2.00	80	75	Pmin+3	D-0
L5506	Q1HG	2.13	60	52	Pmin+4	D-0
E5506	Q1GL	2.13	80	75	Pmin+4	D-0
L5520	Q1GN	2.26	60	52	Pmin+5	D-0
E5520	Q1GR	2.26	80	75	Pmin+5	D-0
E5530	Q1GK	2.40	80	75	Pmin+6	D-0
E5540	Q1G2	2.53	80	75	Pmin+7	D-0
X5550	Q1GJ	2.67	95	75	Pmin+8	D-0
X5560	Q1GF	2.80	95	75	Pmin+9	D-0
X5570	Q1G9	2.93	95	75	Pmin+10	D-0

Table: Nehalem P-State Projections

C. I²C (Inter-Integrated Circuit)

What is I²C? A simple bi-directional 2-wire bus for efficient inter-integrated circuit control. All I²C-bus compatible devices incorporate an on-chip interface which allows them to communicate directly with each other via the I²C-bus. This design concept solves the many interfacing problems encountered when designing digital control circuits. These I²C devices perform communication functions between intelligent control devices (e.g., microcontrollers), general-purpose circuits (e.g., LCD drivers, remote I/O ports, memories) and application-oriented circuits.

The PowerEdge T610 BIOS accesses the I²C through the ICH9 (Intel I/O Controller Hub 9). There are two MUXes on ICH9's I²C bus.

The clock chips, USB hub, iSCSI key and TPM device addresses are located on the ICH9 I²C bus.

SECTION 10. EMBEDDED NICS

A. Overview / Description

Dual-port Gigabit Ethernet Controller with TCP offload Engine (TOE) support

A dual-port LAN controller with support circuitry is embedded on the PowerEdge T610 system board as independent Ethernet interface device. The device is Broadcom 5709C Gigabit Ethernet controller.

The following information details the features of the LAN device:

- x4 PCI Express Gen2 capable interface
- The PowerEdge T610 operates this controller at Gen1 speed
- MAC and PHY integrated
- 3072x18 Byte context memory
- 64 KB receive buffer
- TOE (TCP Offload Engine)
- iSCSI controller (enabled through an optional hardware key)
- RDMA controller (RNIC) (enabled post RTS through an optional hardware key)
- NC-SI (Network Controller-Sideband Interface) connection
- Wake-On-LAN (WOL)
- PXE 2.0 remote boot
- iSCSI boot
- IPv4 and IPv6 support
- Bare metal deployment support

SECTION 11. I/O SLOTS

A. Overview / Description

The PowerEdge T610 planar provides five PCI Express expansion slots and one dedicated slot, as follows:

- Two x8 PCIe Gen2 slots for full-height full-length cards, and connected to the IOH
- Three x4 PCIe Gen2 slot for full-height half-length cards, and connected to the IOH
- One x4 PCIe Gen1 slot for dedicated storage controller card, and connected to the IOH
- System supports 25W maximum power for the first two PCIe cards and 15W for the 3rd, 4th, and 5th PCIe cards
- The lower power support on the 3rd, 4th, and 5th cards is due to system thermal limitations instead of system power requirements
- The PowerEdge T610 does not support hot-swapping of PCIe cards

The PowerEdge T610 planar incorporates six 164-pin PCI Express-style x8 connectors for connectivity to the PCIe cards.

POWEREDGE T610
PCI Express Gen2 Slots
Slot 1: Half-Length (6.6" Factory Installation) / Full-Height (x8 connector), x4 link width
Slot 2: Full-Length (12.2" Factory Installation) / Full-Height (x8 connector), x8 link width
Slot 3: Full-Length (12.2" Factory Installation) / Full-Height (x8 connector), x8 link width
Slot 4: Half-Length (6.6" Factory Installation) / Full-Height (x8 connector), x4 link width
Slot 5: Half-Length (6.6" Factory Installation) / Full-Height (x8 connector), x4 link width

POWEREDGE T610						
Category	Card Priority	Description	Dell PN	PCIe Link Width	Slot Priority	Max Cards
Internal Storage (Integrated Slot)	1	Dell™ PERC 6/i Integrated (Sled)	T95 4J	Gen1 x8	Integrated	1
Internal Storage (Integrated Slot)	2	Dell SAS 6/iR Integrated (Sled)	YK8 38	Gen1 x8	Integrated	1
External Storage Controller	3	*Dell PERC 5/E Adapter (Test only, no factory install)	GP2 97	Gen1 x8	Slot 4, 5 ¹	2 ²
External Storage Controller	4	*Dell PERC 6/E Adapter (512MB)	J15 5F	Gen1 x8	Slot 3, 2, 5, 4, 1	2 ²
External Storage Controller	5	*Dell PERC 6/E Adapter (256MB)	F98 9F	Gen1 x8	Slot 3, 2, 5, 4, 1	2 ²
10Gb NIC	6	*Intel 10GBase-T Copper Single Port NIC (Copperpond)	XR9 97	Gen1 x8	Slot 4, 5, 1, 2, 3	2
10Gb NIC	7	*Broadcom BCM57710 10GBase-T Copper Single Port NIC (Quiver)	RK3 75	Gen1 x8	Slot 4, 5, 1, 2, 3	2
10Gb NIC	8	Intel® 10GBase-SR Optical Single Port NIC (BelleFontaine)	RN 219	Gen1 x8	Slot 4, 5, 1, 2, 3	2
External Storage Controller	9	*Dell SAS 5/E Adapter	M7 78G	Gen1 x8	Slot 3, 2, 4, 5, 1	2 ²
Internal Tape Controller	10	Dell SAS 5/iR Adapter (for internal tape only)	UN 939	Gen1 x8	Slot 3, 2, 4, 5, 1	2 ²
Fibre Channel 8 HBA	11	Emulex LPe12002 FC8 Dual-Channel HBA	C85 6M	Gen2 x4	Slot 4, 5, 1, 2, 3	5
Fibre Channel 8 HBA	12	Emulex LPe12000 FC8 Single-Channel HBA	C85 5M	Gen2 x4	Slot 4, 5, 1, 2, 3	5
Fibre Channel 4 HBA	13	Emulex LPe11002 FC4 Dual-Channel HBA	KN1 39	Gen1 x4	Slot 4, 5, 1, 2, 3	5
Fibre Channel 4 HBA	14	Emulex LPe1150 FC4 Single-Channel HBA	ND 407	Gen1 x4	Slot 4, 5, 1, 2, 3	5
1Gb NIC	15	Intel Gigabit VT Copper Quad-Port NIC (Springport)	YT6 74	Gen1 x4	Slot 4, 5, 1, 2, 3	5
Fibre Channel 4 HBA	16	QLogic QLE2462 FC4 Dual-Channel HBA	DH 226	Gen1 x4	Slot 4, 5, 1, 2, 3	5
Fibre Channel 4 HBA	17	QLogic QLE2460 FC4 Single-Channel HBA	PF3 23	Gen1 x4	Slot 4, 5, 1, 2, 3	5
SCSI HBA	18	LSI Logic LSI2032 SCSI HBA (Sasquatch)	NU 947	Gen1 x4	Slot 4, 5, 1, 2, 3	2

POWEREDGE T610						
Category	Card Priority	Description	Dell PN	PCIe Link Width	Slot Priority	Max Cards
Fibre Channel 8 HBA	19	QLogic QLE2562 FC8 Dual-Channel HBA	G44 4C	Gen2 x4	Slot 4, 5, 1, 2, 3	5
Fibre Channel 8 HBA	20	QLogic QLE2560 FC8 Single-Channel HBA	G42 5C	Gen2 x4	Slot 4, 5, 1, 2, 3	5
Fibre Channel 4 HBA	21	QLogic QLE220 FC4 Single-Channel HBA	YY0 04	Gen1 x4	Slot 4, 5, 1, 2, 3	5
1Gb NIC	22	Intel PRO/1000PT Gigabit Copper Dual-Port NIC (Redwater)	X39 59	Gen1 x4	Slot 4, 5, 1, 2, 3	5
1Gb NIC	23	Broadcom BCM5709C IPV6 Gigabit Copper Dual-Port NIC with TOE and iSCSI Offload (Dragonfly)	F16 9G	Gen1 x4	Slot 4, 5, 1, 2, 3	5
1Gb NIC	24	Broadcom BCM5709C IPv6 Gigabit Copper Dual-Port NIC with TOE (Dragonwing)	G21 8C	Gen1 x4	Slot 4, 5, 1, 2, 3	5

¹ Thermal testing to determine if the PERC5 can be installed in other slots is pending.

² A maximum of 2 internal/external storage controllers (Dell PERC and SAS cards) are allowed in the system in addition to the integrated storage controller.

Note: The PowerEdge T610 supports up to 25W maximum power for the first two cards and up to 15W for the third, fourth, and fifth PCIe cards regardless of which slots are populated (does not apply to the Internal Storage Slot). This restriction applies to any PCIe cards that have a maximum power over 15W. PCIe cards that are affected by this restriction are noted in the table above by an asterisk.

This list was generated based on thermal, mechanical, and performance inputs. Generally speaking, thermal requirements were a priority for any card over 15W (PERC and most 10G NIC cards). Performance considerations (e.g., matching link width to slot width) were factored in once both thermal and mechanical constraints were met. In some cases, the performance considerations took priority over thermals – this was done after consulting with the thermal team.

CONSTRAINTS	
Thermal	PERC 5/E-slot order must be Slot 4,5 PERC 6/E - there is sufficient thermal margin to allow for a 3,2,5,4,1 order 10Gb NICs - slot order must be 4,5,1,2,3 SAS 5/E and 5/iR - there is sufficient thermal margin to allow for a 3,2,4,5,1 order Rest of the PCIe cards - recommended slot order is Slot 4,5,1,2,3
Mechanical	Slot 1 - Half-length (6.6"), full-height Slot 2 - Full-length (12.2"), full-height Slot 3 - Full-length (12.2"), full-height Slot 4 - Half-length (6.6"), full-height Slot 5 - Half-length (6.6"), full-height
Performance	Slot 1 - PCIe Gen2 x4 Slot 2 - PCIe Gen2 x8 Slot 3 - PCIe Gen2 x8 Slot 4 - PCIe Gen2 x4 Slot 5 - PCIe Gen2 x4

B. Boot Order

PCIe scan order (from the BIOS HW spec v1.0)

IOH port 1,2 (PCI Express Gen1 x4) - BCM5709C Embedded NIC #1

IOH port 3 (PCI Express Gen1 x4) - Slot 5

IOH port 9 (PCI Express Gen1 x4) - Slot 1

IOH port 7/8 (PCI Express Gen2 x8) - Slot 2

IOH port 5/6 (PCI Express Gen2 x8) - Slot 3

IOH port 4 (PCI Express Gen1 x4) - Slot 4

IOH port 10 (PCI Express Gen1 x4) - PERC6i

SECTION 12. STORAGE

A. Overview / Description

The PowerEdge T610 has an eight-drive backplane for 2.5" drives and an eight-drive backplane for 3.5" drives. There are eight hot-swap capable Serial Attached SCSI (SAS) or Serial ATA (SATA) slots with two LED indicators per slot, two Mini-SAS cable connectors for connecting the backplane to the integrated SAS 6/iR or PERC 6/i, a 10-pin planar signal connector and an 8-pin PDB power connector.

For SATA/SAS mixing, two SAS drives are supported with the 2.5" or 3.5" backplane. In this configuration, one pair of drives will be SAS and the remaining six drives will be SATA.

B. Drives

The PowerEdge T610 supports 2.5" and 3.5" hard drive carriers. These carriers implement new industrial design to match the front bezel. Legacy carriers are not supported on the PowerEdge T610.

For the slots that are not occupied by drives, a carrier blank is provided to maintain proper cooling, maintain a uniform appearance to the unit, and provide EMI shielding.

The PowerEdge T610 does not support diskless configuration.

Each disk drive carrier has two LED indicators visible from the front of the system. One is a green LED for disk activity and the other is a bicolor (green/amber) LED for status information. The activity LED is driven by the disk drive during normal operation. The bicolor LED is controlled by the SEP device on the backplane. Both LEDs are used to indicate certain conditions under direction of a storage controller.

The PowerEdge T610 system supports up to eight 2.5" or 3.5" hard disk drives.

- Support for 10,000 and 15,000 rpm 2.5" SAS drives
- Support for 15,000 rpm 3.5" SAS drives
- Support for 7200 rpm 3.5" Near Line SAS drives
- Support for 7200 rpm 2.5" Enterprise SATA drives
- Support for 7200 rpm 3.5" Enterprise SATA drives
- Support for 2.5" Solid State Drives (SSD)
 - SSDs require the PERC 6/i Integrated storage controller and cannot be mixed with any other type of hard drive
- Up to eight SAS OR up to eight SATA drives are supported
- For SAS/SATA mixing, two SAS and up to six SATA drives are possible
 - A pair of SAS drives must be installed in slots 0 and 1
- One mixed 2.5" and 3.5" hard drive configuration is allowed:
 - A pair of 2.5" 10k rpm SAS drives must be installed with an adapter in a 3.5" hard drive carrier in drive slots 0 and 1
 - The remaining hard drives must be 3.5" hard drives and must be either all SAS or all SATA

2.5 HDDs	
2.5" Enterprise SATA 7.2K HDs	160GB, 250GB, and 500GB
2.5" SAS 10K HDs	73GB, 146GB, and 300GB
2.5" entry 10K SAS in 3.5" HDD carrier	73GB and 146GB
2.5" SAS 15K HDs	73GB and 146GB
Enterprise SATA SSD	25GB, 50GB, and 100GB
2.5" SSD	25GB and 50GB
3.5 HDDs	
Support for 3.5" Enterprise SATA 7.2K	160GB, 250GB, 500GB, 750GB, and 1000GB
Support for 3.5" Enterprise SATAu 7.2K	500GB SATAu, 750GB SATAu, and 1000 GB SATAu
Support for 3.5" Green Enterprise SATA 5.4K	1000GB
Support for 3.5" Near Line SAS 7.2K	500GB, 750, and 1000GB
Support for 3.5" SAS 15K HDs	146GB, 300GB, and 450GB

Table: PowerEdge T610 supported HDD matrix

POWEREDGE T610

Platforms	✓
All 2.5" HDD SAS (or) SATA	✓
All 3.5" HDD SATA (or) SATA	✓
Mixed SAS/SATA*	✓
2.5" SAS in 3.5" HDD Carrier (RTS+)	✓
2.5" SAS HDD in 3.5" HDD Carrier + 3.5" SAS HDDs (Mixed SAS)	✓
2.5" SAS HDD in 3.5" HDD Carrier + 3.5" SATA HDDs (Mixed SAS/SATA)	✓

Table: Supported HDD/SSD Matrix

C. RAID Configurations

PowerEdge T610 Factory Configuration Summary

CONFIG TYPE	CONFIGS		DESCRIPTION	NON-MIXED DRIVES, ALL SATA OR ALL SAS		MIXED SAS/ SATA MIN 2xSAS+1xSATA 2.5": MAX 2xSAS + 6xSATA 3.5": MAX 2xSAS + 6xSATA	
				MIN HDD	MAX HDD	MIN HDD	MAX HDD
SAS/SATA (No RAID)	0	MSS	Integrated SAS/SATA No RAID (SAS 6/iR)	2.5"=1 3.5"=1	2.5"=8 3.5"=8		
SAS/SATA (RAID)	1	MSSR0	Integrated SAS/SATA RAID 0 (SAS 6/iR, PERC6/i)	2.5"=1* 3.5"=1*	2.5"=8 3.5"=8	N/A	
	2	MSSR1	Integrated SAS/SATA RAID 1 (SAS 6/iR, PERC6/i)	2.5"=2 3.5"=2	2.5"=2 3.5"=2	N/A	
	3	MSSR5	Integrated SAS/SATA RAID 5 (PERC 6/i)	2.5"=3 3.5"=3	2.5"=8 3.5"=8	N/A	
	4	MSSR6	Integrated SAS/SATA RAID 6 (PERC 6/i)	2.5"=4 3.5"=4	2.5"=8 3.5"=8	N/A	
	5	MSSR10	Integrated SAS/SATA RAID 10 (PERC 6/i)	2.5"=4 3.5"=4	2.5"=8 3.5"=8		
	6	MSSR1R1	Integrated SAS/SATA RAID 1/RAID 1 (SAS 6/iR, PERC 6/i)	2.5"=2+2 3.5"=2+2	2.5"=2+2 3.5"=2+2		
	7	MSSR1R5	Integrated SAS/SATA RAID 1/RAID 5 (PERC 6/i)	2.5"=2+3 3.5"=2+3	2.5"=2+6 3.5"=2+6		

CONFIG TYPE	CONFIGS		DESCRIPTION	NON-MIXED DRIVES, ALL SATA OR ALL SAS		MIXED SAS/ SATA MIN 2xSAS+1xSATA 2.5": MAX 2xSAS + 6xSATA 3.5": MAX 2xSAS + 6xSATA	
				MIN HDD	MAX HDD	MIN HDD	MAX HDD
SAS/SATA (No RAID)	8	MSS-X	Integrated SAS/SATA No RAID (SAS 6/iR)			2.5"=3 3.5"=3	2.5"=6 3.5"=6
SAS/SATA (RAID)	9	MSSR1R1- X	Integrated SAS/SATA RAID 1/RAID 1 (SAS 6/iR, PERC 6/i)			2.5"=2+2 3.5"=2+2	2.5"=2+2 3.5"=2+2
	10	MSSR1R5-X	Integrated SAS/SATA RAID 1/RAID 5 (PERC 6/i)			2.5"=2+3 3.5"=2+3	2.5"=2+6 3.5"=2+6

* Minimum of 1 hard drive for PERC6i ; and minimum of 2 for SAS6iR.

CONFIG TYPE	CONFIGS		DESCRIPTION	NON-MIXED DRIVES, ALL SSD		MIXED SSD/ SAS MIN 2xSSD+1xSAS 2.5": MAX 2xSSD + 6xSAS	
				MIN HDD	MAX HDD	MIN HDD	MAX HDD
SSD (RAID)	11	MSSR1	Integrated SSD RAID 1 (PERC 6/i)	2.5"=2 3.5"=N/A	2.5"=2 3.5"=N/A	N/A	
	12	MSSR5	Integrated SSD RAID 5 (PERC 6/i)	2.5"=3 3.5"=N/A	2.5"=3 3.5"=N/A	N/A	
	13	MSSR10	Integrated SSD RAID 10 (PERC 6/i)	2.5"=4 3.5"=N/A	2.5"=8 3.5"=N/A	N/A	
SSD/SAS (RAID)	14	MSSR1R5-X	Integrated SSD/SAS RAID 1/RAID 5 (PERC 6/i)			2.5"=2+3 3.5"=N/A	2.5"=2+6 3.5"=N/A

D. Storage Controllers

I. SAS 6/iR Description

The integrated SAS 6/iR HBA is a half-length expansion card that plugs into a dedicated PCIe x8 storage slot (only wired for x4). It incorporates two four-channel SAS IOCs for connection to SAS/SATA hard disk drives. It is designed in a form factor that will allow the same card to be used in the PowerEdge T610, R710, and R610.

II. PERC 6/i Description

For customers who need a more advanced hardware RAID solution, the PERC 6/i is an option. The PERC 6/i uses the LSI 1078 ROC (RAID on Chip) processor with a PCI Express host interface and DDR2 memory. A battery is also available for backup. For details of that card, see the PERC 6 Hardware Specification.

	STORAGE CARD	USAGE	POWEREDGE T610 SUPPORT	SLOT	PCIe CON	PCIe BRACKET	I/O CON	RAID	BBU
PERC SAS/SATA	PERC 6/i Integrated	Internal Backplane Storage (HDD, SSD)	Yes, Max 1	Storage slot	x8	No	x4 int x4 int	0, 1, 5, 6, 10, 50, and 60	BBU
	PERC 6/E Adapter	External SAS/SATA Storage	Yes, Max 2 (MD1000 Pompano & MD1020 Ridgeback)	PCIe slot	x8	Yes	x4 ext x4 ext	0, 1, 5, 6, 10, 50, and 60	TBBU
	PERC 5/E Adapter	External Legacy Storage	Yes, Max 2 (MD1000 Pompano only)	PCIe slot	x8	Yes	x4 ext x4 ext	0, 1, 5, 10, and 50	TBBU
SAS HBA SAS/SATA	SAS 6/iR Integrated	Internal Backplane Storage (No tape or SSD support)	Yes, Max 1	Storage slot	x8	No	x4 int x4 int	0, 1	No
	SAS 5/iR Adapter	Internal SAS Tape	Yes, Max 2	PCIe slot	x8	Yes	x4 int	n/a	No
	SAS 5/E Adapter	External SAS (DAS, Tape)	Yes, Max 2	PCIe slot	x8	Yes	x4 ext x4 ext	none	No
ICH SATA	On Planar via chipset	Internal SATA Optical/ Tape (No HDD)	Yes, 2 ports for Optical and/or Tape	n/a	n/a	n/a	x1 int	n/a	n/a
LSI SCSI	LSI 2032 Adapter	Internal/ External SCSI Tape or Ext legacy SCSI storage	Yes, Max 2	PCIe slot	x4	Yes	x1 int x1 ext	n/a	n/a

NOTE: A maximum of 2 external storage controllers (Dell PERC and SAS cards) are allowed in the system in addition to the integrated storage controller.

E. LED Indicators

Each disk drive carrier has two LED indicators visible from the front of the system. One is a green LED for disk activity and the other is a bicolor (green/amber) LED for status information. The activity LED is driven by the disk drive during normal operation. The bicolor LED is controlled by the SEP device on the backplane. Both LEDs are used to indicate certain conditions under direction of a storage controller.

F. Optical Drives

SATA optical drives are optional in all PowerEdge T610 systems and connect to the planar via the SATA interface to ICH9. IDE (PATA) optical drives are not supported.

The following internal optical drives are available on the PowerEdge T610: DVD-ROM and DVD+/-RW.

If the optical drive is not ordered with the system, a blank is installed in its place. In the absence of tape drive, an optional second SATA optical drive is installed in the bay adjacent to the first optical drive.

G. Tape Drives

A tape backup unit (TBU) is optional in all PowerEdge T610 systems and connects to the planar SATA, SCSI controller card, or SAS controller card. An IDE tape drive is not supported.

The PowerEdge T610 supports a maximum of one half-height or one full-height TBU. A full-height TBU would take up both drive bays and would prevent an optical drive from being installed.

The following tape drives are available for usage on the PowerEdge T610: internal SATA, SCSI, and SAS drives; external SCSI and SAS drives. Internal SCSI tape drives connect through the LSI 2032 PCI Express SCSI adapter card. SAS TBUs connect through the SAS5iR card.

If the tape drive is not ordered with the system, a blank is installed in its place.

T610 SUPPORTED TBUS	
Internal Tape	Catfish Internal (RD1000 Half-Height SATA)
	LTO2L (Legacy, Half-Height, SCSI)
	LTO3-060 & LTO3L-060 (Half-Height SCSI)
	LTO4-120 (Half-Height, Low-Cost, SAS)
	DAT72 Half-Height SCSI
Internal Tape Drive Bays	One 3.5" half-height tape drive bay (Catfish)
	One 5.25" half-height tape drive bay (LTO4, 3, 2 value)
External TBU	Catfish External (RD1000 USB)
	LTO-2L (Legacy, SCSI)
	LTO-3-060 (SCSI)
	LTO-3 (Legacy, SCSI)
	LTO-4-120 (Half-High SAS)
	2U external TBU (Hammerhead - PV114T)
	DAT72 Half-Height SCSI
External TBU/ Automation	Shadow 4U SAS, SCSI, iSCSI, and FC
	Shadow 2U SAS, SCSI, iSCSI, and FC
	ML6000 Family SAS, SCSI, and FC
	2U external TBU (Seabass - PV124T) Legacy SCSI

Table: PowerEdge T610 supported TBUs

SECTION 13. VIDEO

A. Overview / Description

The PowerEdge T610 system Integrated Dell™ Remote Access Controller 6 (iDRAC6) incorporates an integrated video subsystem, connected to the 32-bit PCI interface of the ICH. This logic is based on the Matrox G200. The device only supports 2D graphics. The integrated video core shares its video memory with the iDRAC6's 128MB DDR2 application space memory. This memory is also used for the KVM buffer.

The PowerEdge T610 system supports the following 2D graphics video modes:

RESOLUTION	REFRESH RATE (HZ)	COLOR DEPTH (BIT)
640 x 480	60, 72, 75, and 85	8, 16, and 32
800 x 600	56, 60, 72, 75, and 85	8, 16, and 32
1024 x 768	60, 72, 75, and 85	8, 16, and 32
1152 x 864	75	8, 16, and 32
1280 x 1024	60, 75, and 85	8 and 16
1280 x 1024	60	32

Table: PowerEdge T610 Video Modes

SECTION 14. AUDIO

A. Overview / Description

No speakers supported.

SECTION 15. RACK INFORMATION

A. Overview / Description

Rack installation components such as rails are provided with the PowerEdge T610 Rack Kit. The rack installation components are as follows: Sliding Rack mount with latest generation Cable Management Arm (CMA). The PowerEdge T610 will feature slam latches to offer easier removal from the rack.

When the system is installed in a rack, please observe the following guidelines:

- Nothing should be located within 12" of the front of the unit that would restrict the airflow into the system.
- Nothing should be mounted or placed behind the chassis that would restrict airflow from exiting the system. Only Dell approved CMAs can be placed behind the chassis. All other objects should be located at least 24" away from the rear of the chassis.

When 2 systems are placed back to back, the separation between the units should be at least 24" if the exit airflow is equivalent for the two chassis. This will allow the exit air to escape without creating an extreme back pressure at the rear of one of the chassis.

THE POWEREDGE T610 RACK SUPPORTS THE FOLLOWING

Support for Dell 4210 & 2410 racks

Support for Dell 4200 & 2400 racks without CMA

Support for HP/Compaq 10XXX series racks

Support for HP/Compaq 9XXX & 7XXX series racks without CMA

B. Cable Management Arm (CMA)

CMA to support the following cable load:

- 2 Power cables
- 10 SAS cables
- 2 CAT6
- 1 status indicator
- 1 KVM dongle (mounted internal to CMA basket)

C. Rails

Support for tool-less installation in CEA-310-E compliant square hole 4-post racks including:

- Support for Dell Racks (4220, 2420)
- Support for Dell Racks (4210, 2410)
- Support for Dell Racks (4200, 2400)
- Support for HP/Compaq 9xxx & 10xxx Series Racks
- Support for tool-less installation in CEA-310-E compliant round hole 4-post racks
- Support full extension of the system out of the rack to allow serviceability of key internal components

THE POWEREDGE T610 RAIL SUPPORTS THE FOLLOWING:

Support for tool-less installation in CEA-310-E compliant square hole 4-post racks including:

Support for Dell 2410 24U Rack

Support for Dell 4210 Rack

Support for HP/Compaq 10xxx series

Support for tooled or tool-less installation in CEA-310-E compliant round hole 4-post racks (tool-less preferred)

Full extension required (to allow serviceability of key internal components)

SECTION 16. OPERATING SYSTEMS

A. Overview / Description

The PowerEdge T610 supports Windows®, Linux, and Solaris™ operating systems.

B. Operating Systems Supported

Windows® support:

X86 OR X64	INSTALLATION	FACTORY INSTALLATION	LOGO CERTIFICATION	SCHEDULE	TEST/ VALIDATE	SUPPORT
Windows® Small Business Server 2008 and Essential Business Server 2008						
x64	Standard/ Premium	Yes	Windows Hardware Quality Labs - Windows 2008	Shipping	Yes	Yes
Windows Server® 2008 (x64 includes Hyper-V™)						
x64	Standard	Yes	Windows Hardware Quality Labs - Windows 2008	Shipping	Yes	Yes
	Enterprise					
	Datacenter					
Windows Server® 2008						
x86	Standard	Yes	Windows Hardware Quality Labs - Windows 2008	Shipping	Yes	Yes
	Enterprise					
Windows® Web Server 2008						
x86 and x64	Web	Yes	Windows Hardware Quality Labs - Windows 2008	Shipping	Yes	Yes
Windows Server® 2008, SP2 (x64 includes Hyper-V™)						
x64	Standard	Yes	Windows Hardware Quality Labs - Windows 2008	Available in August - October 2009	Yes	Yes
	Enterprise					
	Datacenter					
Windows Server® 2008, SP2						
x86	Standard	Yes	Windows Hardware Quality Labs - Windows 2008	Available in August - October 2009	Yes	Yes
	Enterprise					
Windows® Web Server 2008, SP2						
x86 and x64	Web	Yes	Windows Hardware Quality Labs - Windows 2008	Available in August - October 2009	Yes	Yes

X86 OR X64	INSTALLATION	FACTORY INSTALLATION	LOGO CERTIFICATION	SCHEDULE	TEST/ VALIDATE	SUPPORT
Windows Server® 2008, R2, (x64 includes Hyper-V™)						
x64	Standard	Yes	Windows Hardware Quality Labs - Windows 2008 Release 2	Available in November 2009 - January 2010	Yes	Yes
	Enterprise					
	Datacenter					

Linux support:

Red Hat® Enterprise Linux 4.7						
x86 and x64	ES/AS	Available in June 2009	N/A	Available in June 2009	Yes	Yes
Red Hat Enterprise Linux 5.2						
x86 and x64	Standard/AP	Yes	N/A	Shipping	Yes	Yes
Red Hat Enterprise Linux 5.3						
x86 and x64	Standard/AP	Available in June 2009	N/A	Available in June 2009	Yes	Yes
Novell® SUSE® Linux Enterprise Server 10 SP2						
x64	Enterprise	Yes	N/A	Shipping	Yes	Yes
Novell SUSE Linux Enterprise Server 11						
x64	Enterprise	Available in June 2009	N/A	Available in June 2009	Yes	Yes
Solaris™ 10 05/09						
x64	Enterprise	Drop in the box	N/A	Available in June 2009	Yes	Yes

SECTION 17. VIRTUALIZATION**A. Overview / Description**

Supported embedded hypervisors:

- Microsoft® Windows Server® 2008 Hyper-V
- VMware® ESXi Version 4.0 and 3.5 update 4
- Citrix® XenServer 5.0 with Hotfix 1 or later

SECTION 18. SYSTEMS MANAGEMENT

A. Overview / Description

Dell is focused on delivering open, flexible, and integrated solutions that help our customers reduce the complexity of managing disparate IT assets. We build comprehensive IT management solutions. Combining Dell PowerEdge Servers with a wide selection of Dell-developed management solutions, we provide customers choice and flexibility – so you can simplify and save in environments of any size.

To help you meet your server performance demands, Dell offers Dell OpenManage™ systems management solutions for:

- Deployment of one or many servers from a single console
- Monitoring of server and storage health and maintenance
- Update of system, operating system, and application software

We offer IT management solutions for organizations of all sizes – priced right, sized right, and supported right.

B. Server Management

A Dell Systems Management and Documentation DVD and a Dell Management Console DVD are included with the product. ISO images are also available. The following sections briefly describe the content.

Dell Systems Build and Update Utility: Dell Systems Build and Update Utility assists in OS install and pre-OS hardware configuration and updates.

OpenManage Server Administrator: The OpenManage Server Administrator (OMSA) tool provides a comprehensive, one-to-one systems management solution, designed for system administrators to manage systems locally and remotely on a network. OMSA allows system administrators to focus on managing their entire network by providing comprehensive one-to-one systems management.

Management Console: Our legacy IT Assistant console is also included, as well as tools to allow access to our remote management products. These tools include: Remote Access Service, for iDRAC, and the BMC Management Utility.

Active Directory Snap-in Utility: The Active Directory Snap-in Utility provides an extension snap-in to the Microsoft Active Directory. This allows you to manage Dell specific Active Directory objects. The Dell-specific schema class definitions and their installation are also included on the DVD.

Dell Systems Service Diagnostics Tools: Dell Systems Service and Diagnostics tools deliver the latest Dell optimized drivers, utilities, and operating system-based diagnostics that you can use to update your system.

eDocs: The section includes Acrobat files for PowerEdge systems, storage peripheral and OpenManage software.

Dell Management Console DVD: The Dell Management Console is a Web-based systems management software that enables you to discover and inventory devices on your network. It also provides advanced functions, such as health and performance monitoring of networked devices and patch management capabilities for Dell systems.

Server Update Utility: In addition to the Systems Management Tools and Documentation and Dell Management Console DVDs, customers have the option to obtain Server Update Utility DVD. This DVD has an inventory tool for managing updates to firmware, BIOS and drivers for either Linux or Windows varieties.

C. Embedded Server Management

The PowerEdge T610 implements circuitry for the next generation of Embedded Server Management. It is Intelligent Platform Management Interface (IPMI) v2.0 compliant. The iDRAC6 (Integrated Dell Remote Access Controller) is responsible for acting as an interface between the host system and its management software and the peripheral devices. These peripheral devices consist of the PSUs, the storage backplane, integrated SAS HBA or PERC 6/i and control panel with display.

The iDRAC6 provides features for managing the server remotely or in data center lights-out environments.

Advanced iDRAC features require the installation of the iDRAC6 Enterprise card.

I. Unmanaged Persistent Storage

The unmanaged persistent storage consists of two ports:

- one internal USB port
- one internal SD Module

The internal port is for an optional USB key and is located inside the chassis. Some of the possible applications of the USB key are:

- User custom boot and pre-boot OS for ease of deployment or diskless environments
- Storage of custom logs or scratch pad for portable user-defined information (not hot-pluggable)

The Internal SD Module is dedicated for an SD Flash Card with embedded Hypervisor for virtualization. The SD Flash Card contains a bootable OS image for virtualized platforms.

II. Lifecycle Controller/Unified Server Configurator

Embedded management is comprised of several pieces which are very interdependent.

- Lifecycle Controller
- Unified Server Configurator
- iDRAC6
- vFLASH

Lifecycle controller is the hardware component that powers the embedded management features. It is integrated and tamperproof storage for system-management tools and enablement utilities (firmware, drivers, etc.). It is flash partitioned to support multiple, future use cases.

Dell Unified Server Configurator is a 1:1 user interface exposing utilities from Lifecycle Controller. Customers will use this interface to configure hardware, update server, run diagnostics, or deploy the operating system. This utility resides on Lifecycle Controller. To access the Unified Server Configurator, press <F10> key within 10 seconds of the Dell logo display during the system boot process. Current functionality enabled by the Unified Server Configurator includes:

FEATURE	DESCRIPTION
Faster O/S Installation	Drivers and the installation utility are embedded on system, so no need to scour DELL.COM
Faster System Updates	Integration with Dell support automatically directed to latest versions of the Unified Server Configurator, iDRAC, RAID, BIOS, NIC, and Power Supply
Update Rollback	Ability to recover to previous “known good state” for all updatable components

FEATURE	DESCRIPTION
More Comprehensive Diagnostics	Diagnostic utilities are embedded on system
Simplified Hardware Configuration	Detects RAID controller and allows user to configure virtual disk and choose virtual disk as boot device, eliminating the need to launch a separate utility. Also provides configuration for iDRAC, BIOS, and NIC/LOM.

III. iDRAC6 Express

The iDRAC6 Express is the first tier of iDRAC6 upgrades. In addition to upgrading the system with a Lifecycle Controller, the iDRAC6 Express offers the following key features:

- Graphical web interface
- Standard-based interfaces
- Server Sensor monitoring and fault alerting
- Secure operation of remote access functions including authentication, authorization, and encryption
- Power control and management with the ability to limit server power consumption and remotely control server power states
- Advanced troubleshooting capabilities

For more information on iDRAC6 Express features see the table below.

IV. iDRAC6 Enterprise

The optional iDRAC6 Enterprise card provides access to advanced iDRAC6 features. The iDRAC6 Enterprise connects directly to the T610 planar and is mounted parallel to the planar with stand-offs.

Key features for the iDRAC6 Enterprise include:

- Scripting capability with Dell's Racadm command-line
- Remote video, keyboard, and mouse control with Virtual Console
- Remote media access with Virtual Media
- Dedicated network interface

Additionally, the iDRAC6 Enterprise can be upgraded by adding the vFlash Media card. This is a 1GB Dell branded SD card that enables a persistent 256MB virtual flash partition. In the future, vFlash will be expanded to include additional features.

A more detailed feature list for iDRAC6 Enterprise and vFlash is included in the table below.

FEATURE	BMC	IDRAC6 EXPRESS	IDRAC6 ENTERPRISE	VFLASH MEDIA
Interface and Standards Support				
IPMI 2.0	✓	✓	✓	✓
Web-based GUI		✓	✓	✓
SNMP		✓	✓	✓
WSMAN		✓	✓	✓
SMASH-CLP		✓	✓	✓

FEATURE	BMC	IDRAC6 EXPRESS	IDRAC6 ENTERPRISE	VFLASH MEDIA
Racadm command-line			✓	✓
Conductivity				
Shared/Failover Network Modes	✓	✓	✓	✓
IPv4	✓	✓	✓	✓
VLAN tagging	✓	✓	✓	✓
IPv6		✓	✓	✓
Dynamic DNS		✓	✓	✓
Dedicated NIC			✓	✓
Security & Authentication				
Role-based Authority	✓	✓	✓	✓
Local Users	✓	✓	✓	✓
Active Directory		✓	✓	✓
SSL Encryption		✓	✓	✓
Remote Management & Remediation				
Remote Firmware Update	✓	✓	✓	✓
Server power control	✓	✓	✓	✓
Serial-over-LAN (with proxy)	✓	✓	✓	✓
Serial-over-LAN (no proxy)		✓	✓	✓
Power capping		✓	✓	✓
Last crash screen capture		✓	✓	✓
Boot capture		✓	✓	✓
Serial-over-LAN		✓	✓	✓
Virtual media			✓	✓
Virtual console			✓	✓
Virtual console sharing			✓	✓
Virtual flash				✓
Monitoring				
Sensor Monitoring and Alerting	✓ ¹	✓	✓	✓
Real-time Power Monitoring		✓	✓	✓
Real-time Power Graphing		✓	✓	✓
Historical Power Counters		✓	✓	✓

FEATURE	BMC	IDRAC6 EXPRESS	IDRAC6 ENTERPRISE	VFLASH MEDIA
Logging Features				
System Event Log	✓	✓	✓	✓
RAC Log		✓	✓	✓
Trace Log		✓	✓	✓

SECTION 19. PERIPHERALS

A. USB Peripherals

The PowerEdge T610 supports the following USB devices:

- DVD (bootable; requires two USB ports)
- USB Key (bootable)
- Keyboard (only one USB keyboard is supported)
- Mouse (only one USB mouse is supported)

B. External Storage

EXTERNAL STORAGE	
SAN Support	EMC's AX Arrays (SCSI, FC, and iSCSI)
	EMC's CX Arrays (SCSI, FC, and iSCSI)
	EqualLogic's PS5XXX Arrays (iSCSI)
SAS Management SW for xBOD	OMSS X.X for MD1000
	OMSS X.X for MD1020
	OMSS X.X for MD3000
	OMSS for MD3000i
PV NAS	Attachment to PV NX1950 including iSCSI and clustering support
	Attachment to NF100, NF500 & NF600
PV NAS	Attachment to EMC NS500G (S&P)
PV DAS	MD1000 JBOD
	MD3000 RBOD
	MD1120 2.5 SAS/SATA JBOD
	MD1100 3.5 SAS/SATA JBOD
PV SAN	MD3000i iSCSI RAID array
EqualLogic™	PS5000 family
	PS5500 family
SAS xBOD SW	OpenManage Storage Manager

SECTION 20. DOCUMENTATION

A. Overview, Description, and List

The PowerEdge T610 uses the new enterprise documentation set. The following is a summary of some of the documents slated for the PowerEdge T610 product. For the complete list of documents, including language requirements and delivery scheduling, refer to the Documentation Matrix and the Documentation Milestones in the InfoDev Functional Publications Plan.

- **Getting Started Guide:** This guide provides initial setup steps, a list of key system features, and technical specifications. This document is required for certain worldwide regulatory submittals. This guide is printed and shipped with the system, and is also available in PDF format on the Dell support site.
- **Hardware Owner’s Manual:** This document provides troubleshooting and remove/replace procedures, as well as information on the System Setup program, system messages, codes, and indicators. This document is provided to customers in HTML and PDF format at the Dell support site.
- **System Information Label:** The system information label documents the system board layout and system jumper settings and is located on the system cover. Text is minimized due to space limitations and translation considerations. The label size is standardized across platforms.
- **Information Update:** This is a PDF document that provides information on late changes and issues having significant customer impact which were discovered after document signoff.
- **General System Information Placemat:** This is a paper document that is provided with every system. The document provides general information about the system, including software license agreement information and the location of the service tag.
- **Rack Placemat:** This is a paper document that is provided with the rack kits. The document provides an overview of procedures for setting up the rack.
- **Tower-to-Rack Conversion Guide:** This is a PDF document available on the Dell support site that provides instructions on how to convert PowerEdge T610 from a tower configuration to a rack configuration.

SECTION 21. PACKAGING OPTIONS

PACKAGING	PROVIDE PACKAGING TO SUPPORT SYSTEM	
	Packaging should incorporate keyboard, mouse, bezel, Doc, CDs, rails	<ul style="list-style-type: none">• Will not bag the server in outbound pack• Multi-pack rails targeted to go in a box within the multi-pack but investigation underway for a separate box for ease of customer staging• Accessory tray needs a cover and icon showing contents• Doc Box – separate box within the main box containing import documentation and software (OS, OM, etc.)

APPENDIX A**T610 Volatility Chart.**

	NON-VOLATILE RAM	VOLATILE RAM	REFERENCE DESIGNATOR	QTY	SIZE	TYPE [e.g., FLASH PROM, EEPROM]:
PLANAR, POWEREDGE T610						
System BIOS SPI Flash	Y		U6A1	1	4MB	Flash EEPROM (SPI interface)
LOM Configuration Data	Y		U15, U16	1	512KB	FLASH (NOR)
iDRAC6 Controller ROM	Y		U_IBMC	1	4KB	ROM
iDRAC6 Controller RAM		Y	U_IBMC	1	8KB	RAM
System CPLD	Y		U_CPLD	1	1200 Macro cells	Internal Flash EEPROM
System CPLD		Y	U_CPLD	1	1KB	RAM
iDRAC6 Express Internal Flash	Y		U_EMMC	1	1GB	NAND FLASH
System RAM		Y	J7F6, J7F5, J7F4, F7F3, J8F3, J8F2, J5F3, J5F4, J5F1, J5F2, J4F1, J4F2	12	up to 18 DIMMs *16GB	RAM
TPM ID EEPROM (Plug in module only)	Y		U_SEEPROM	1	256B	EEPROM
TPM Binding EEPROM (on China planar only)	Y		U1H1	1	256B	EEPROM
iDRAC6 SDRAM		Y	U_IBMC_MEM	1	128MB	DDR2 RAM
iDRAC6 FRU	Y		U_IBMC_FRU	1	4KB	EEPROM
iDRAC6 Boot Block Flash	Y		U_IBMC_SPI	1	2MB	FLASH (NOR)
Trusted Platform Module	Y	N	U_TPM	1	128 bytes	EEPROM
CHIPSET						
CMOS	Y			1	256KB	Battery backed RAM
2.5" BACKPLANE OR 3.5" BACKPLANE						
Storage Controller Processor	Y		U-SEP	1	32KB	Embedded Microcontroller Flash
CONTROL PANEL						
Internal USB	Y		J_USBKEY (connector)	1	User selectable	License key hard set ROM or user choice
Internal SD Module	Y		J_SDCARD (Connector)	1	User selectable - 1GB shipped	Secure Digital NAND Flash
POWER SUPPLY						
PSU Microcontroller	Y			2	Maximum supported = 2MB per PSU	Embedded microcontroller flash
PERC 6/I INTEGRATED						
PERC NVSRAM Config Data	Y		U23	1	32KB	Non-volatile SRAM
PERC Firmware	Y		U24	1	4MB	FLASH (NOR)
PERC Cache RAM		Y	U58-61	1	256MB	RAM
FRU	Y		U40	1	256MB	EEPROM
IBUTTON Key EEPROM	Y		U21	1	1KB	EEPROM
CPLD	Y		U_CPLD	1	72 macrocells	Internal Flash EEPROM
SAS 6/iR Integrated						
Controller Configuration Data	Y		U3	1	4MB	FLASH (NOR)
FRU	Y		U4	1	256KB	EEPROM
Integrated Mirroring NVSRAM	Y		U1	1	32KB	Non-volatile SRAM
iDRAC6 Enterprise						
VFlash	Y		J_SD (connector)	1	1GB @ RTS, Larger later	Secure Digital NAND Flash

T610 Volatility Chart Continued.

		CAN USER PROGRAMS OR OPERATING SYSTEM WRITE DATA TO IT DURING NORMAL OPERATION?	PURPOSE? [e.g., BOOT CODE]
PLANAR, POWEREDGE T610			
System BIOS SPI Flash	No		Boot Code, System Configuration Information, EUFI environment
LOM Configuration Data	No		LAN on motherboard configuration and firmware
iDRAC6 Controller ROM	No		not utilized
iDRAC6 Controller RAM	No		iDRAC internal RAM
System CPLD	No		System-specific hardware logic
System CPLD	No		not utilized
iDRAC6 Express Internal Flash	No for iDRAC Operating System. Yes for Managed System Services Repository		iDRAC Operating System plus Managed System Services Repository (i.e., Unified Server Configurator, OS drivers, diagnostics, rollback versions of various programmables)
System RAM	Yes		System OS RAM
TPM ID EEPROM (Plug in module only)	No		BIOS Identification of TPM module
TPM Binding EEPROM (on China planar only)	No		BIOS binding of plug in module to a particulare planar
iDRAC6 SDRAM	No		BMC OS + VGA frame buffer
iDRAC6 FRU	No		Motherboard electronic product identifier
iDRAC6 Boot Block Flash	No		iDRAC boot loader and configuration (i.e., MAC address), life cycle log, and system event log
Trusted Platform Module	yes		Storage of encryption keys
CHIPSET			
CMOS	No		BIOS settings
2.5" BACKPLANE OR 3.5" BACKPLANE			
Storage Controller Processor	No		Backplane firmware (HDD status, etc.)
CONTROL PANEL			
Internal USB	Yes as allowed by OS		Normal usage is read only software license key, but not limited
Internal SD Module	Yes as allowed by OS		Normal usage is embedded hypervisor OS but not limited
POWER SUPPLY			
PSU Microcontroller	No		Power supply operation, power telemetry data, and fault behaviors
PERC 6/I INTEGRATED			
PERC NVSRAM Config Data	No		Stores configuration data of HDDs
PERC Firmware	No		Storage Controller Firmware
PERC Cache RAM	No - not directly.		Storage RAID controller cache
FRU	No		Card product identification for system inventory purposes
IBUTTON Key EEPROM	No		Feature enablement encrypted key
CPLD	No		HW control logic (i.e., power sequencing)
SAS 6/iR Integrated			
Controller Configuration Data	No		Stores configuration data of HDDs
FRU	No		Card product identification for system inventory purposes
Integrated Mirroring NVSRAM	No		Stores configuration data of HDDs
iDRAC6 Enterprise			
VFlash	Yes - When enabled, installed, and the media does not have the write protect switch applied		Storage of logs, user images like files, drivers, OS's, etc.

T610 Volatility Chart Continued.**HOW IS DATA INPUT TO THIS MEMORY?**

PLANAR, POWEREDGE T610	
System BIOS SPI Flash	Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not operate. Future firmware releases may add support for recovery of a bad/corrupted BIOS ROM image via the iDRAC (administrator privilege plus specific firmware, binary, and commands)
LOM Configuration Data	Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable containing the firmware file and the loader. LOMs loaded with arbitrary data in firmware memory would not operate.
iDRAC6 Controller ROM	N/A
iDRAC6 Controller RAM	iDRAC embedded system
System CPLD	Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable (currently only DRMK utility support) containing the firmware file and the loader. System loaded with arbitrary data in CPLD memory would not operate.
System CPLD	Not utilized
iDRAC6 Express Internal Flash	iDRAC OS: Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable containing the firmware file and the loader. System loaded without a good iDRAC firmware image yields a non-functional iDRAC. Managed Services Repository: Various partitions are loaded via vendor-provided firmware file and loader program just like iDRAC OS.
System RAM	System OS
TPM ID EEPROM (Plug in module only)	Factory load only.
TPM Binding EEPROM (on China planar only)	BIOS only
iDRAC6 SDRAM	Embedded iDRAC OS for 108MB and 8MB for VGA frame buffer
iDRAC6 FRU	Factory and iDRAC embedded OS
iDRAC6 Boot Block Flash	Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable or out-of-band firmware updates across the management network. Bad contents yield the iDRAC inoperable and unrecoverable in the customer environment. Note the life cycle log is automatically updated by the iDRAC as various system component FW, HW, and SW versions are changed.
Trusted Platform Module	Using TPM-enabled operating systems
CHIPSET	
CMOS	BIOS control only via input such as BIOS F2 menu user configuration settings (such as boot order)
2.5" BACKPLANE OR 3.5" BACKPLANE	
Storage Controller Processor	Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable (DRMK, USC, OS DUPs utility support) containing the firmware file and the loader. Backplane loaded with bad firmware will not provide backplane and HDD status.
CONTROL PANEL	
Internal USB	Either read-only license key or OS control copies
Internal SD Module	Factory load, OS run time usage, and OS updates and configuration changes.
POWER SUPPLY	
PSU Microcontroller	Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable (Unified Server Configurator) containing the firmware file and the loader. PSUs loaded with bad firmware will not provide PSU functional behavior and result in PSU system faults.
PERC 6/I INTEGRATED	
PERC NVSRAM Config Data	Embedded storage firmware controls this data
PERC Firmware	Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable (DUPs, Unified Server Configurator) containing the firmware file and the loader. Storage adapters loaded with bad firmware will not provide storage controller behavior.
PERC Cache RAM	Embedded storage firmware controls the use of storage cache data.
FRU	Factory only. Not customer updatable.
IBUTTON Key EEPROM	Factory only. Not customer updatable.
CPLD	Factory only. Not customer updatable.
SAS 6/iR Integrated	

T610 Volatility Chart Continued.**HOW IS DATA INPUT TO THIS MEMORY?**

PLANAR, POWEREDGE T610	
System BIOS SPI Flash	Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable containing the firmware file and the loader. System loaded with arbitrary data in firmware memory would not operate. Future firmware releases may add support for recovery of a bad/corrupted BIOS ROM image via the iDRAC (administrator privilege plus specific firmware, binary, and commands)
LOM Configuration Data	Loading flash memory requires a vendor-provided firmware file and loader program that is executed by booting up the system from a floppy or OS-based executable containing the firmware file and the loader. LOMs loaded with arbitrary data in firmware memory would not operate.
iDRAC6 Controller ROM	N/A

HOW IS THIS MEMORY WRITE PROTECTED?**HOW IS THE MEMORY CLEARED?**

PLANAR, POWEREDGE T610		
System BIOS SPI Flash	Software write protected	Not possible with any utilities or applications and system is not functional if corrupted/removed.
LOM Configuration Data	Not explicitly protected but special applications are needed to communicate through the LOMs to reprogram this ROM.	Not user clearable
iDRAC6 Controller ROM	Protected permanently by hardware	Not clearable
iDRAC6 Controller RAM	n/a	iDRAC reset
System CPLD	Requires special system-specific utility	Not possible with any utilities or applications and system is not functional if corrupted/removed.
System CPLD	It's not accessible	Not clearable
iDRAC6 Express Internal Flash	Writes are proxied through a temporary iDRAC scratchpad RAM and not directly made from an OS or OS application.	Not user clearable
System RAM	OS control	Reboot or power down system
TPM ID EEPROM (Plug in module only)	HW read only	Not - read only
TPM Binding EEPROM (on China planar only)	Locked by BIOS from physical access by anyone after boot	N/A - BIOS control only
iDRAC6 SDRAM	n/a	AC cycle for BMC OS and reset / power off server for VGA frame buffer
iDRAC6 FRU	Writes controlled by iDRAC embedded OS	EPPID is not clearable
iDRAC6 Boot Block Flash	iDRAC embedded OS control of the write protection.	Not possible with any utilities or applications and iDRAC does not function as expected if corrupted/removed. Lifecycle log is clearable only in a factory environment. SEL is user clearable.
Trusted Platform Module	SW write protected	F2 setup option
CHIPSET		
CMOS	N/A - BIOS only control	Planar NVRAM_CLR jumper or remove AC cord, remove cover, remove coin cell battery. Wait for 30 seconds, replace battery, cover, and then AC cord. F2 system setup option to restore defaults
2.5" BACKPLANE OR 3.5" BACKPLANE		
Storage Controller Processor	Embedded firmware only writeable through controlled iDRAC methods	Not possible with any utilities or applications and backplane does not function as expected if corrupted/removed.
CONTROL PANEL		
Internal USB	OS control	OS control format
Internal SD Module	Only by SD card write-protect switch.	OS control format
POWER SUPPLY		
PSU Microcontroller	Protected by the embedded microcontroller. Special keys are used by special vendor-provided utilities to unlock the ROM with various CRC checks during load.	N/A - not in-system clearable

T610 Volatility Chart Continued.

	HOW IS THIS MEMORY WRITE PROTECTED?	HOW IS THE MEMORY CLEARED?
PLANAR, POWEREDGE T610		
System BIOS SPI Flash	Software write protected	Not possible with any utilities or applications and system is not functional if corrupted/removed.
LOM Configuration Data	Not explicitly protected but special applications are needed to communicate through the LOMs to reprogram this ROM.	Not user clearable
iDRAC6 Controller ROM	Protected permanently by hardware	Not clearable
iDRAC6 Controller RAM	n/a	iDRAC reset
System CPLD	Requires special system-specific utility	Not possible with any utilities or applications and system is not functional if corrupted/removed.
System CPLD	It's not accessible	Not clearable
iDRAC6 Express Internal Flash	Writes are proxied through a temporary iDRAC scratchpad RAM and not directly made from an OS or OS application.	Not user clearable
System RAM	OS control	Reboot or power down system
TPM ID EEPROM (Plug in module only)	HW read only	Not - read only
TPM Binding EEPROM (on China planar only)	Locked by BIOS from physical access by anyone after boot	N/A - BIOS control only
iDRAC6 SDRAM	n/a	AC cycle for BMC OS and reset / power off server for VGA frame buffer
iDRAC6 FRU	Writes controlled by iDRAC embedded OS	EPPID is not clearable